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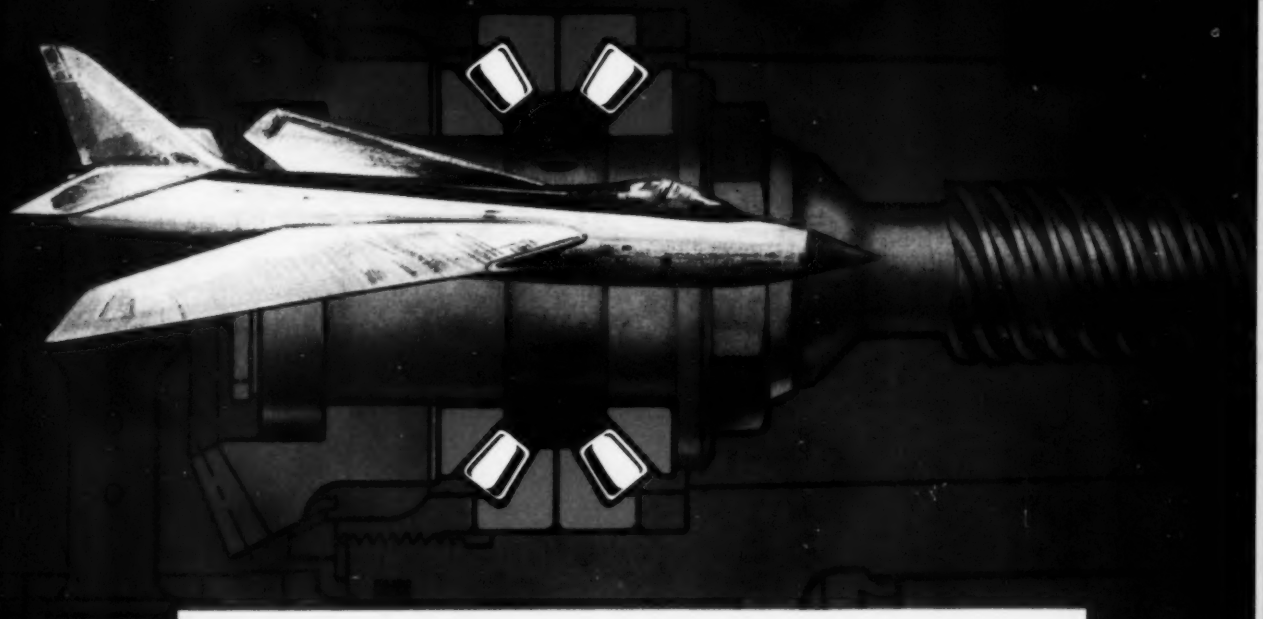

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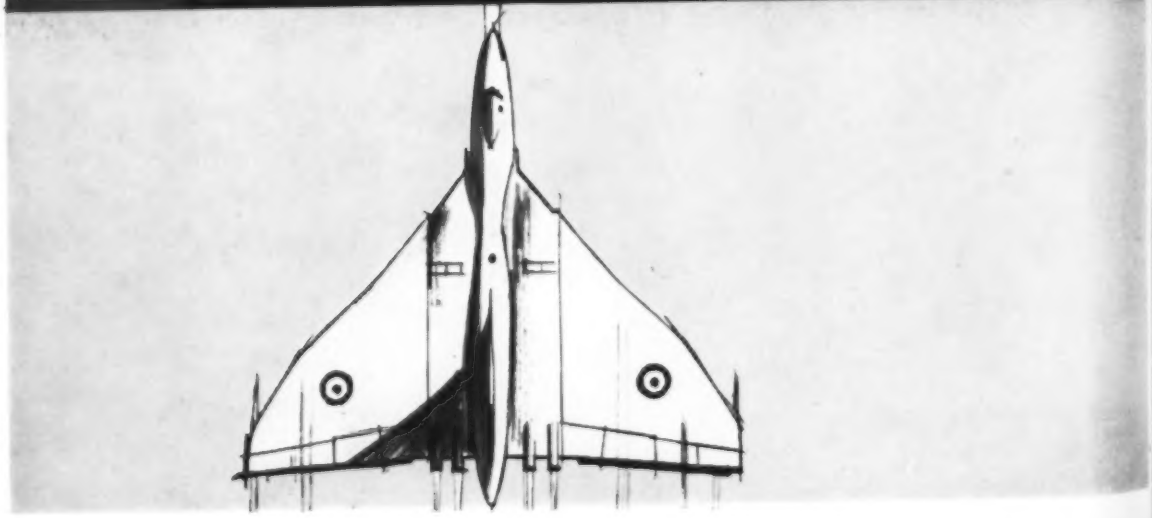

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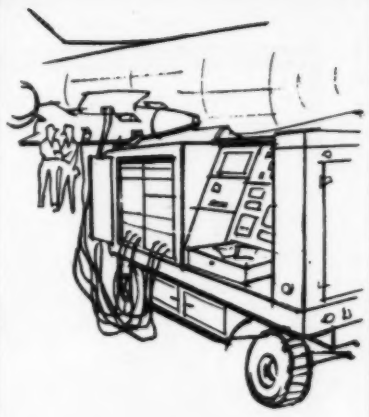

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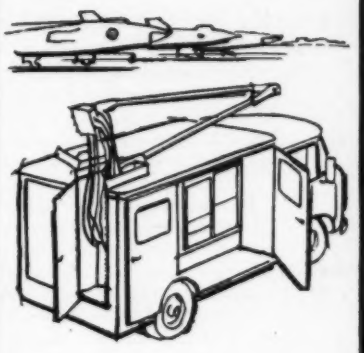

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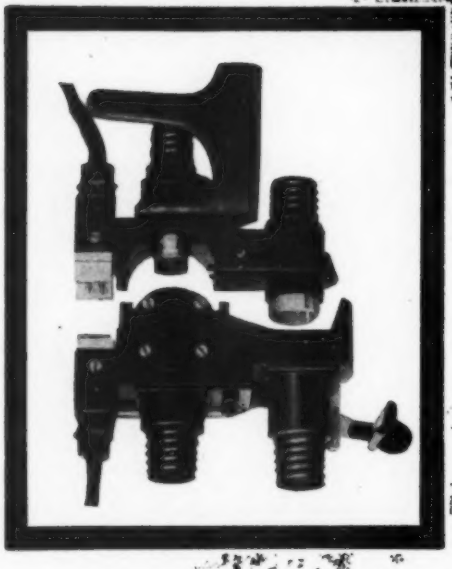

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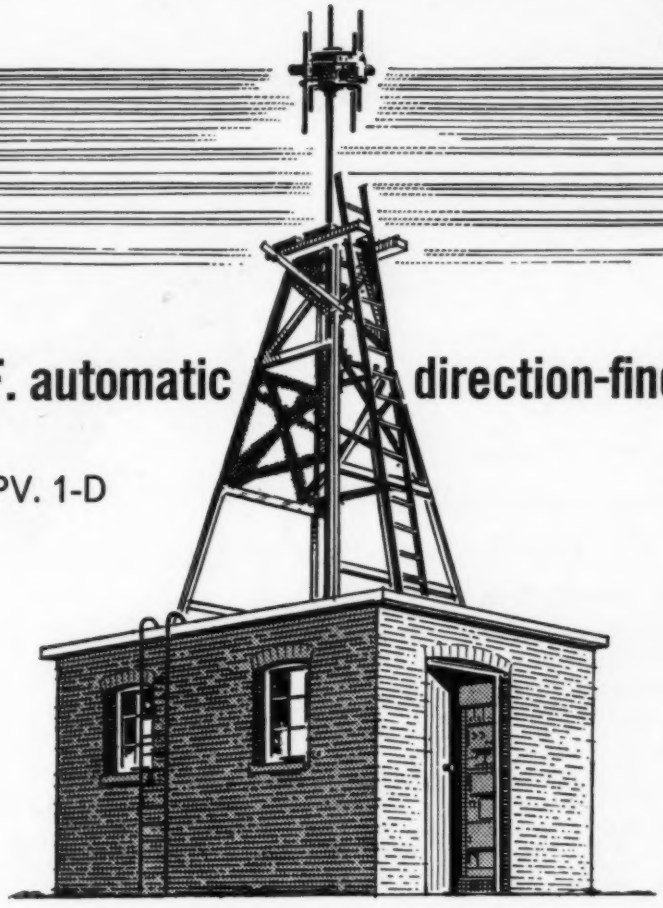

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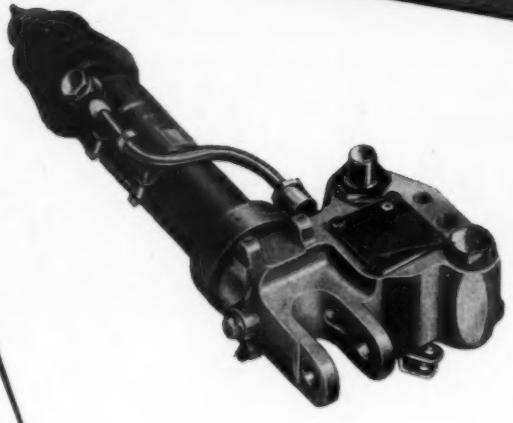

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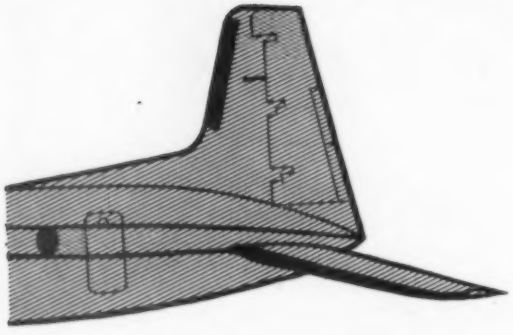

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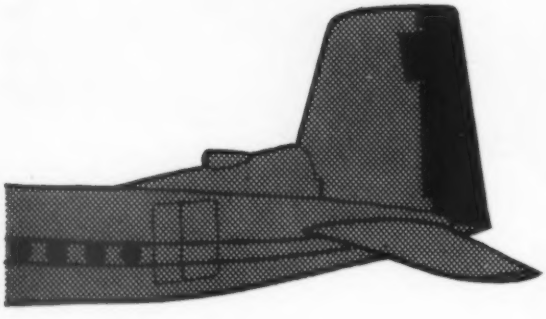

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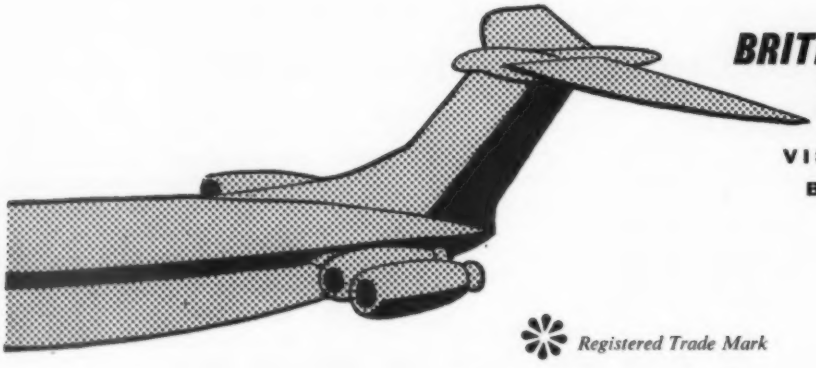

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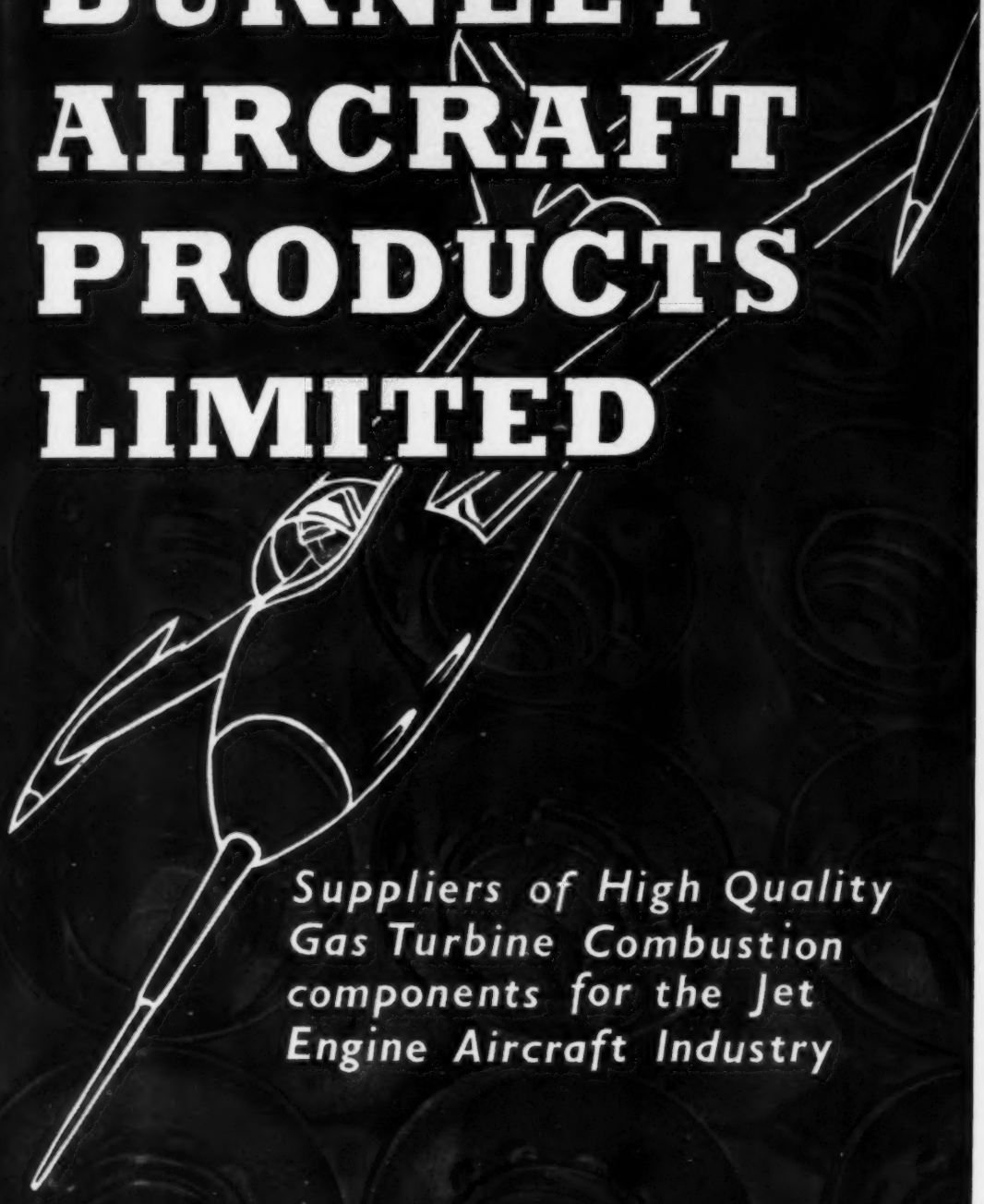

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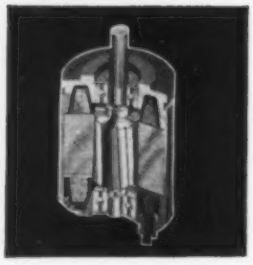

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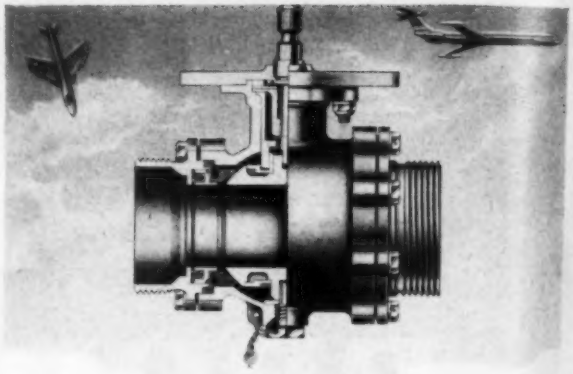

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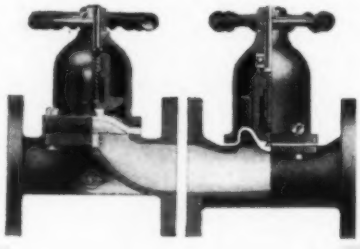

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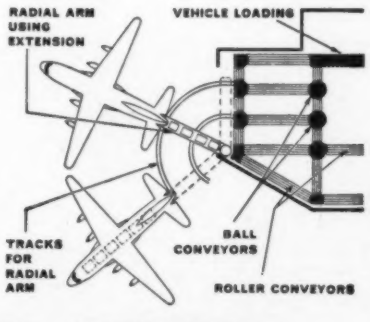

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No 2727 VOLUME 79 THURSDAY 15 JUNE 1961

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On the Eve of Battle

IN our issue of May 18 we suggested that Britain's two biggest independents, British United Airways and Cunard Eagle Airways, might come together to rationalize their route requirements. Both had lodged with the Air Transport Licensing Board an overlapping series of applications for new European and domestic routes, and it seemed that this internecine contest was about as sensible as two members of the same party fighting for one constituency. We suggested (not without inspiration) that the two independents should do a swap—Cunard Eagle perhaps exchanging European applications for British United's UK domestic applications.

This, broadly speaking, is what the two independents have just done: there is now only slight overlapping of requirements, and each has withdrawn its objections to all of the other's applications, due to come up before the Board next Tuesday, June 20. A more detailed review of the situation appears on page 841.

Many, if not all, of the European routes applied for raise economic and political problems, more delicate than those brought up at the recent relatively straightforward Cunard Eagle *v.* BOAC North Atlantic hearing. In that case there was one applicant, one objector and in effect one route, with no fundamental disagreement about the adequacy of traffic, and no real doubts about Britain's right to have a second airline on the route. Even so, that hearing lasted 18¾hr, over six days. If the 69 applications and 257 objections to be heard at Public Meeting No 21, which begins next Tuesday, are going to be aired in comparable detail, the meeting could be interminable. Obviously, if our Air Transport Licensing Board is to avoid becoming as ponderous as the US Civil Aeronautics Board, the watchword of the parties involved will have to be—keep it brief.

To Pool or Not

On the eve of this battle, which will affect the destiny of British air transport more than any other previous tussle, it would be wrong to take sides. Whatever the result, however, nothing but good can come of it. Everything for which both the corporations and the independents stand will be tested, challenged and justified—in public. Pooling, which BEA endorses and which the independents might shrewdly repudiate in principle, will be one of the major issues discussed. So will traffic rights. It will become apparent that the future of the independents rests not so much with the Air Transport Licensing Board as with foreign governments. Nothing the Board decides will assuage the protectionist outlook of those countries to which British carriers—corporations and independents alike—wish to operate more air services. And whatever the Board may decide it is the Minister who, through his supreme powers over the disposal of appeals and the negotiation of traffic rights, will always have the final word.

It is significant that the Minister never (as he had the power to do on the grounds of diplomatic inexpediency) directed the Board to reject the applications that it is now about to hear. Britain is the biggest generator of air traffic in Europe and the Minister can and must drive very hard bargains with foreign governments on behalf of *all* Britain's airlines, corporations and independents.

FIRST AIR-TO-AIR picture of the Breguet 941 blown-wing STOL transport, which was first flown on June 1. Take-off and landing runs are quoted as "not more than 100m" (328ft). The aircraft was airborne for 12min in the hands of test-pilot Bernard Witt

FROM ALL QUARTERS

Tri-Nation Jet Lift

IN a written Parliamentary reply on June 7, the Minister of Aviation, Mr Peter Thorneycroft, stated: "The Minister of Defence and I have agreed with the Federal German Minister of Defence to conclude an early agreement for a joint development of a vertical take-off and landing strike fighter based on the Hawker P.1127. In addition, we have agreed with the French and German Governments, jointly, to develop the Rolls-Royce RB.162 jet lift engine. These are important steps forward in the Government's policy of co-operating with NATO countries in the development of military equipment suitable for meeting national and NATO needs."

This is the first time the RB.162 has been officially referred to, although it has several times been mentioned in unofficial reports. It is almost certainly the new lift engine for which Rolls-Royce are able to claim a thrust/weight ratio of 16 : 1; and it is probably the powerplant which will lift the VTOL derivative of the Mirage III and the Sud project mentioned on page 738 of the November 11 issue of *Flight*. One report has described how multiple RB.162s could be grouped in a package for use beneath the wings of the AW.660 and similar transports.

Hawker and Folland Changes

IN board changes announced by Hawker Aircraft, Mr J. T. Lidbury becomes chairman and Sir Sydney Camm is appointed managing director and chief engineer. Mr Lidbury, previously managing director, takes over as chairman from Sir Roy Dobson, vice-chairman and managing director of the Hawker Siddeley Group. This will allow Sir Roy, who will remain on the Hawker board, to devote more time to group matters.

The appointment is also announced of Mr R. L. Lickley as Hawker deputy managing director and of Mr E. G. Rubython as general manager. Mr W. J. Heasman becomes secretary of the company. Hawker Aircraft's board is now as follows: Mr J. T. Lidbury, chairman; Sir Sydney Camm, managing director and chief engineer; Mr R. L. Lickley, deputy managing director; Mr E. G. Rubython, general manager; Mr J. D. Stranks, works director; and Mr R. H. Chaplin, chief designer. Sir Thomas Sopwith, Sir Roy Dobson and Mr S. D. Davies are members of the board without specific appointments.

It is also announced that Mr Lidbury succeeds Sir Roy Dobson as chairman of Folland Aircraft, Mr Lickley taking over from Mr Lidbury as managing director.

STOL Belfast

IN several recent issues this journal has discussed likely contenders in the RAF competition for an STOL "Beverley replacement" transport. The most attractive and versatile designs prepared to meet this requirement are doubtless the BAC-208 entered by British Aircraft Corporation and an Armstrong Whitworth design entered by Hawker Siddeley Aviation, both of which are powered by four Bristol Siddeley Pegasus lift/thrust turbofans. But these high-subsonic machines, capable of VTOL at something less than maximum weight, are clearly much further off in development than STOL derivatives of existing turboprop aircraft. The BAC-222, derived from the Lockheed C-130C, has already been described; it is now possible to comment on an STOL Belfast.

The basic Short Bros & Harland Belfast C.1 is a 218,000lb machine powered by four Rolls-Royce Tyne RTy.12 turboprops and carrying a maximum payload of 85,000lb over 1,150 miles. Required field-length at full weight is 7,000ft. It is worth noting that the 10,000cu ft hold of the Belfast is appreciably larger than that of any of the rival STOL designs. To confer STOL ability—which may reduce required runway length to well below 2,000ft—Short and Harland have designed a quickly detachable pack providing air for flap blowing, plus a substantial additional airflow to blow all the control surfaces, in order to preserve control at much reduced airspeeds. The pack, which fits above the fuselage behind the hump created by the wing, contains three lightweight gas-turbine/compressor units which blow air through ducts passing across the rear part of the wing and along all tail surfaces. Such an arrangement would require no modification to the propulsive engines, which in cruising flight would operate at their most economical r.p.m. The rival BAC-222 is deliberately overpowered in the cruise, since the main engines are used to provide shaft-power for the auxiliary STOL compressors.

B-52 Structural Trouble

ANY major modification to a big modern aeroplane is awesomely expensive, and the US Air Force is faced with a bill of some $210m (£75m) following the discovery of fatigue cracks in the Boeing B-52G and B-52H heavy bombers which are now in volume production for Strategic Air Command. These new "wet-wing" versions, with greatly increased weight and machined-plank wing skins, have suffered local stresses greater than any experienced with the earlier versions of lower weight and performance. Two B-52Gs are said to have suffered structural failure in the air.

Lt-Gen M. E. Bradley, Deputy Chief of Staff for Materiel, told a Congressional committee that "a major modification programme" is essential. It will take between 12 and 18 months to complete; aircraft on the line will be modified before delivery, and the 100 or so B-52Gs at present flying are being returned to Wichita in batches. Selected aircraft are to be subjected to intensive static testing, and all those due for modification will be "kept under surveillance" to ensure that they do not exceed given i.a.s. and manœuvre loadings.

US/Canada Defence Deal Reported

EVER since the Avro CF-105 Arrow was cancelled in February 1959, the RCAF has needed a two-seat all-weather fighter to replace the obsolescent CF-100, notwithstanding the bulk purchase of CF-104 Starfighters for the Air Division in Europe and the decision to adopt IM-99B Bomarc as an area-defence missile at two bases in Quebec and Ontario. For many months it was hoped that MATS would buy a large number of Canadair CL-44 swing-tail freighters in exchange for adoption by the RCAF of the McDonnell F-101B Voodoo or possibly the Convair F-106 Delta Dart. In the event, MATS contracted for the very advanced Lockheed C-141 (tiding over the gap with C-130E and C-135 aircraft), and since the end of last year Canada's most saleable product for the deal has been the Canadair CF-104.

On June 11 the Washington correspondent of the Canadian Press news agency filed a despatch claiming that a deal would be concluded within 48hr. The gist of the agreement is that the RCAF will receive "about 66" F-101Bs made by McDonnell, the US paying 75 per cent of the $120m (£42.9m) cost, while—on a similar 75-25 basis—Canadair will produce "some 200" CF-104s which the US will supply to "NATO allies." In addition, Canada will henceforth bear all the costs of running the Pine Tree line of early-

STRICTLY SUB-ORBITAL: This undistinguished Yak-18 has now become a Soviet National shrine, for on it Maj Yuri Gagarin did his first solo in 1955. The photograph was taken at the "Dynamo" stadium in Saratov, when the local aviation club transferred custody of the aircraft to the District Study Museum, where it will be permanently on view

UNWELCOME BOOSTER: This method of transportation is being seriously considered for the second stage of the Saturn space vehicle. The Douglas C-133 could fly the big tank sections from Sacramento to the Cape in 10hr, compared with the 24 days needed for shipment by barge via the Panama Canal. No method of air-lifting the first stage is in prospect

DISCUSSING SEACAT with Mr R. M. Armour, Short Brothers' assistant chief engineer on that missile, is (left) Captain E. A. Good, CBE, who has joined the company as technical representative for Seacat in Australia and New Zealand, both of whose navies are adopting it. Captain Good was London technical liaison officer for the Australian Dept of Defence, 1956-58

warning stations, and will apparently also repay the US Government in cash instalments. This deal, which seems to be aimed principally at maintaining employment in Montreal and St Louis, will cost the US $240m (£85.7m) and Canada $80m (£28.6m), and is far larger than any similar previous peacetime agreement.

Vickers in 1960

IN his review of the 1960 operations of the Vickers Group, Viscount Knollys gave the interesting news that "As regards the variable-geometry aircraft, a further Ministry of Aviation contract for theory studies, aerodynamics and engineering experimental programmes, and the building of a fuselage centre-section, two stub-wings and fore-wing, covering a period extending into 1962, is expected in the near future." This is the first indication for many months that Vickers polymorphic designs are still active projects.

Other news given by the Vickers chairman is that design work and tooling manufacture for the initial batch of TSR.2 aircraft ordered by the MoA will continue during the year, that "considerable interest is being expressed by important American airlines" in the BAC One-Eleven, that production of the Viscount is continuing beyond the 429 sold, that the company's accounts are not based on the assumption of additional orders for the Vanguard and that the first VC.10s are still due for delivery in 1963; the Super VC10 will fly early in 1964, while the BAC One-Eleven is to fly in 1963.

HIMALAYAN HELICOPTER: the Osterman/Autair Bell 47G-3 (see news-item on this page) among the high peaks

Himalayan Helicopter

HELICOPTER operations were recently carried out in Nepal by Autair Ltd in conjunction with Osterman, the Swedish helicopter company. Using a turbo-supercharged Bell 47G-3, which they purchased at the end of last year specifically for high-altitude operation, Autair operated at heights between 7,000 and 11,000ft a.s.l. and occasionally as high as 15,000ft.

Autair have also made flights in connection with the recent Himalayan scientific mountaineering expedition led by Sir Edmund Hillary. These flights involved landings at a camp located at 15,000ft, only 20 miles from the summit of Mt Everest.

Turbulent Tour

A SERIES of flights round the coast of the British Isles in a Turbulent is being undertaken by 14 student officers of No 140 course at No 8 Flying Training School at RAF Swinderby, Lincs. They graduated there on June 9 and were setting out last Monday.

The Turbulent is making a total of 22 flights on its peripheral journey and ground support is being given by five servicing teams travelling by road, their itinerary so planned that the aircraft will be turned round at the end of each leg. The student pilots all have some 230hr flying experience, on Jet Provosts and Vampire T.11s.

Unlucky KLM

NINETEEN were killed, out of 29 passengers and crew of seven, when a KLM Lockheed Electra hit a hill on the approach to Cairo at 0211 BST on June 12. The aircraft, on a Rome-Karachi service, was flown by a British captain, Cdr K. J. Reynolds, who survived; one of the dead was KLM's station manager at Rangoon. Later on the same day the airline stated that the accident "was not caused by any of the shortcomings" which have previously afflicted the Electra.

After a fire which started 200 miles out over the Atlantic had destroyed its port outer engine, a DC-7C on charter from KLM made a safe landing at Prestwick last Sunday. The fire started when the aircraft, which had 73 passengers and a crew of eight, was at 17,000ft. There was fierce vibration—caused by propeller windmilling after failure of the feathering mechanism—and the pilot, Capt Wilhelm Bellink, dived the aircraft from 17,000ft to 1,000ft in an effort to put out the flames. The damaged engine tore itself loose at 1,000ft, narrowly missing the aircraft's tailplane.

These incidents come on top of the complete loss, with all 61 on board, of KLM's newest Douglas DC-8 off Lisbon, when under charter to Viasa (Venezuela). This was reported in our June 8 issue.

JOINT WINNERS in the US Army's design competition for a four-seat light observation helicopter are the Hiller 1100 (left) and Bell D-250, both seen here in mock-up form. The 250 h.p. Allison T63 turbine will be the powerplant in each case

FARNBOROUGH FIGHTER: At the RAE Open Days reported on pages 826-7 this local product, 1917 vintage, was demonstrated by Gp Capt D. P. Hanafin and Wg Cdr R. A. Watts. The S.E. 5A was re-built by Farnborough apprentices under Mr C. R. Wills

FROM ALL QUARTERS...

Canadian Pratt & Whitney Aircraft's PT6 500 h.p. free-turbine flew for the first time at the beginning of the month. The engine is a turbo-prop version, mounted in the nose of a Beech 18 by de Havilland Canada (picture, April 20, page 520).

Investigations into the loss of the USAF B-58 Hustler at the Paris Air Show on June 3 are being concentrated on the theory that it may have "lost" an engine, either by failure or by a pod having become detached from a wing during the aircraft's roll.

Two squadrons of USAF F-100 Super Sabres reached Wethersfield and Woodbridge last Saturday after flying across the Atlantic (3,500 miles) from Cannon, New Mexico, and Myrtle Beach, NC. The aircraft, which are to make a return flight in a few days, were controlled en route by the Air Operations Center at 12th Air Force headquarters, Waco, Texas.

Following Denis Tayler's flight in the Short SC.1 from RAE Bedford to the Paris Show (*Flight* last week) the aircraft made the return journey last Thursday. Owing to the short range of this experimental VTOL machine the trip again had to be made in short stages—in this case seven, most of them again involving cross-wind vertical landings to unprepared surfaces.

The Westland Belvedere which flew from London to Paris in 1hr 41min 43sec on May 30 made the return flight on June 2 in 1hr 40min 45sec. Both times are subject to official confirmation. The pilot was Mr C. T. D. ("Sox") Hosegood, chief test pilot of the Bristol helicopter division of Westland Aircraft.

The D.H. Aeronautical Technical School Old Boys' Association annual Midsummer Ball will take place at Hatfield Aerodrome restaurant and terrace on Friday, June 30. Members should apply for tickets, price 17s 6d single, to Mr H. D. Wright, Technical School Office, The de Havilland Aircraft Co Ltd, Hatfield.

Two USAF appointments in Europe were announced last week. General S. E. Anderson has been named as air deputy to General Norstad, succeeding General Leon Johnson on August 1; and Lt-Gen Truman Landon, USAF Deputy Chief of Staff, becomes C-in-C USAFE in succession to General Frederick Smith, recently made Vice-Chief of Staff in Washington.

The Flying Doctor Service of Africa Ltd has been given permission by the Government of Northern Nigeria to go ahead with a pilot scheme, which may be taken over if the company's efforts prove successful. The idea emanated from Dr Neil Duncan, a GP in Birmingham who was with the original flying doctor service in Australia. It is estimated that £100,000 will be needed to buy an aircraft, build airstrips and meet operating costs over the first three years.

For car racing, motor cycle racing and photographic enthusiasts respectively, special issues of three of our associated journals will be of particular interest. Tomorrow, June 16, *The Autocar* publishes its Le Mans Race Report Number; today the TT Number of *The Motor Cycle* appears; and also on sale is yesterday's (June 14) Holiday Number of *Amateur Photographer*.

IN THE BIRTHDAY HONOURS LIST

THE following are among the recipients more or less closely concerned with aviation whose names appeared in the Queen's Birthday Honours List which was made public last Saturday. We begin with the civil lists of the various Orders, and then follow extracts from the military lists, giving honours and awards to RAF personnel; and these are continued on pages 849-850.

Knights Bachelor

J. F. Baker, Professor of Mechanical Sciences and Head of the Department of Engineering, University of Cambridge; G. R. Blackwood, general manager, Dunlop Rubber Co (Australia); A. G. Clark, chairman and managing director, Plessey Co Ltd; H. E. Snow, chairman and managing director, British Petroleum Co Ltd.

Order of the Bath

CB: R. Burns, under-secretary, MoA; R. C. Sutcliffe, chief scientific officer, Meteorological Office, Air Ministry; A. Wolstencroft, Director of Radio Services.

Royal Victorian Order

KCVO: Basil Smallpeice, managing director, BOAC.

Imperial Service Order

ISO: T. W. V. Jones, senior principal scientific officer, Air Ministry; S. T. L. Mansell, Director of Air Technical Publications, MoA.

Order of the British Empire

GBE: Sir Ivan Stedeford, chairman and managing director, Tube Investments Ltd.

CBE: F. W. Page, director and chief executive, Aircraft Division, English Electric Aviation Ltd; N. H. Searby, manager, Guided Weapons Department, Ferranti Ltd.

OBE: W. J. Brown, Director of Atomic Weapons Production, MoA; C. S. Emery, lately sales director, Sir W. G. Armstrong Whitworth Aircraft Ltd; A. R. Macrae, chief engineer, London Airport, Air Ministry; F. E. Osborne, formerly chief test engineer, Rolls-Royce Ltd, Spadeadam, and now engineering manager, Rolls-Royce Ltd, Lanarks; H. Owen, senior chief executive officer, Air Ministry; S. W. Ranger, chief executive officer, Air Ministry; Wg Cdr E. H. Umbers, chairman, No 148 (Barnsley) Sqn, Air Training Corps; F. W. Wickson, chief executive officer, Royal Aircraft Establishment.

MBE: L. R. Allum, higher executive officer, MoA; Obs Cdr H. P. Barber, Gp Cmdt, No 16 Gp, ROC; W. E. Bell, superintendent, applied electronics laboratory, General Electric Co Ltd, Portsmouth; R. A. Cocke, lately guided weapons trials manager and now Bloodhound project engineer, Bristol Aircraft Ltd; Miss L. V. Cope, clerical officer, MoA; J. W. N. Drew, communications officer, Northern Division, MoA.

A. V. A. Fiddes, clerical officer, RAF Upavon; A. F. Gillbe, engineer II, MoA; P. N. B. Hardaker, senior experimental officer, MoA; F. D. Ley, hon treasurer, No 126 (Derby) Sqn, Air Training Corps; P. H. McAleese, senior technical superintendent (engineering), No 23 MU, RAF Aldergrove; J. V. McIntosh, works manager, fluorescent lamp department, Thorn Electrical Industries Ltd; L. R. Morford, lately higher executive officer, Air Ministry; J. H. Outhwaite, engineer II, MoA.

A. W. Parkin, senior executive officer, Air Ministry; Ald E. Phillips, chairman of committee, No 1223 (Caerphilly) Sqn, Air Training Corps; J. Roy, engineering manager, Ansett-ANA, Australia; Miss M. Sanceau, member of grants committee, RAF Benevolent Fund; Cdr H. Sobey, master, ocean weather ship *Weather Adviser*, Air Ministry; J. D. Swallow, lately higher executive officer, Air Ministry; Capt A. L. A. Whitham, chief pilot, Mac-Robertson-Miller Airlines, Australia; Capt T. R. Young, secretary, Aircraft Owners' and Pilots' Association, Australia.

British Empire Medal

F. Andrews, crane driver, No 14 MU, RAF Carlisle; E. G. J. Bates, civilian instructor, No 766 (Archbishop Tenison's Grammar School) Sqn, Air Training Corps; E. J. Bradshaw, Ldg Obs, Post 31/F.3, No 31 Gp, ROC; W. G. Dixson, chargehand, Signals Research and Development Establishment, MoA; R. Fraser, Clerk of Works, No 21 MU, RAF Fauld; G. E. Gait, foreman, Kelvin & Hughes Ltd, Glasgow; J. McE. Gardiner, engineering technician Grade II, No. 1 Ground Radio Servicing Sqn, RAF Kinloss; H. T. E. Grubb,

Mr Basil Smallpeice (KCVO) and, right, Mr F. W. Page (CBE)

foreman of trades, No 15 MU, RAF Wroughton; S. W. Hemming, senior steward, Boeing 707 fleet, BOAC; B. W. Highley, wire drawer, Bruntons (Musselburgh) Ltd; F. Matheson, Ch Obs, Post 30/S.4, No 30 Gp, ROC; R. H. Mills, research and development craftsman special, RAE Farnborough; G. Morris, lately civilian WO, No 1279 (Melton Mowbray) Sqn, Air Training Corps; H. F. Nalayeh, works superintendent Grade I, RAF, Steamer Point, Aden; H. H. Nell, leading hand, Bristol Aircraft Ltd; H. E. Richards, model-shop foreman, Decca Radar Ltd, Tolworth; S. Stallybrass, radio technician, London Airport; A. E. Tolfree, assistant foreman, Hawker Aircraft Ltd, Kingston-on-Thames.

Honours

ORDER OF THE BATH

Knight Commander: Air Marshal R. B. Lees, CB, CBE, DFC.

Companions: AVM C. Broughton, CBE; AVM B. K. Burnett, DFC, AFC; AVM C. H. Hartley, CBE, DFC, AFC; AVM T. U. C. Shirley, CBE, MIEE, FRAES; AVM F. S. Stapleton, DSO, DFC; AVM P. G. Wykeham, DSO, OBE, DFC, AFC; Acting AVM B. A. Chacksfield, OBE; Air Cdre W. MacI. King, CBE.

(*Continued on page 849*)

Missiles and Spaceflight

F-1

THIS IS THE DESIGNATION of the biggest liquid-propellant rocket engine under development outside the Soviet Union. Rocketdyne Division of North American Aviation have given new details of this powerplant in a paper read recently by David E. Aldrich, F-1 programme manager, and Dominick J. Sanchini, F-1 assistant programme engineer. A condensed version of their text follows.

A comparison of satellite weights announced by the Soviet Union with those launched by the United States demonstrates a significant difference in capabilities. The first two Soviet satellites weighed 184 and 1,120lb, respectively; our first two weighed 31 and 3.25lb, respectively. This difference in weight-lifting capability has continued at a similar magnitude. Our first artificial planet, Explorer IV, weighed about 13lb; the first Soviet artificial planet weighed about 3,100lb. Our Discoverer series of recovery vehicles weighed about 1,700lb, the recovery vehicles launched by the Soviet Union weighed about 10,000lb.

Thus, it was quite obvious that we should "leapfrog" the next step in booster technology and begin immediately the development of very-high-thrust engines. Manned Earth-orbital flight and instrumented probes of the Moon and nearby planets are planned for the early 1960s; and relatively large, manned, Earth-orbiting laboratories, manned exploration of the Moon, and manned orbital trajectories of the nearby planets are planned for the late 1960s. Present vehicles basically perform reconnaissance missions with instrument payloads. For Earth-orbital missions, the payload weights will be in the order of tens of thousands of pounds. For lunar and planetary reconnaissance, the payloads will be in the order of thousands of pounds. These demand the Saturn series of vehicles, boosted by eight 188,000lb engines.

During the late 1960s the payloads to be lifted into Earth orbit are in the order of hundreds of thousands of pounds; for lunar landings and return, and for planetary orbiting, the payloads will be in the order of tens of thousands of pounds. During this period, it is expected that manned space laboratories and lunar bases will be established which will require repeated missions to renew supplies and change personnel. The vehicles accomplishing these missions will be the "wagon trains" of the space age. These are the Nova vehicles, using clusters of F-1 engines. We can illustrate the capabilities of Nova-type vehicles powered with high-energy upper stages by discussing several typical missions which could be accomplished with the same booster with six F-1 engines clustered for a takeoff thrust of 9,000,000lb.

A vehicle of this type would be capable of lofting up to 400,000lb into a low orbit. For example, a mission could be to establish a manned laboratory for astronomical and Earth observations, as well as other scientific and technical studies. Or large "space platforms" could be assembled in 400,000lb increments by multiple-launch and rendezvous techniques. In addition, a large lunar vehicle, or vehicles for manned interplanetary flight, could be assembled and fuelled while in a parking orbit. The F-1 engine would considerably reduce the number of missions required.

Another vehicle would be capable of launching a 65-ton* payload into a 24hr orbit for astronomical or weather observation, Earth surveillance, navigation, and radio and TV communications. Such capsules, capable of being repaired and maintained, could very well be an economical solution to the lofting of satellite systems.

A vehicle of this type could also place up to 90,000lb into a Mars orbit. With such a payload capability, a capsule could be well equipped with instrumentation and telemetering equipment; it could launch robot probes to the surface of the planet and relay the telemetered information back to Earth stations. Alternatively, we would be capable of accomplishing a manned lunar landing and return, with an Earth-landing weight of approximately 20,000lb.

The Rocketdyne F-1 engine, being developed under NASA contract for a Nova-type vehicle, is the direct result of these requirements.

* *The authors' tons are of 2,000lb—Ed.*

The man at bottom centre gives scale to the vast test stand now completed at Edwards for the static firing of twin F-1 engines

Although the contract for the development of the engine was signed in January 1959, the development of a single-chamber, 1,500,000lb engine was already well started. Under the Air Force Rocket Engine Advancement Programme, studies of the feasibility of rocket engines up to one million pounds thrust were begun as early as 1955. These culminated in 1957 with a detailed analysis of a single-chamber, million-pound engine, with supporting model testing and full-scale thrust chamber design. Later in the year the programme was realigned to include three full-scale firing attempts. These tests were concluded in March 1959 with a brief mainstage test at 1,000,000lb thrust, demonstrating stable combustion.

The basic components of the engine [picture on left—Ed] are a tubular-wall thrust chamber, a direct-drive turbopump, a gas generator and their controls. The engine weighs approximately 15,000lb. For simplicity and compactness, the turbopump is mounted directly on the thrust chamber. All other components are either mounted on these two assemblies, or are in the plumbing system between them. When the engine is gimballed, the high-pressure ducting is not flexed. Thrust-vector control is achieved by gimballing the entire engine. The high-pressure fuel is used as the hydraulic actuating medium.

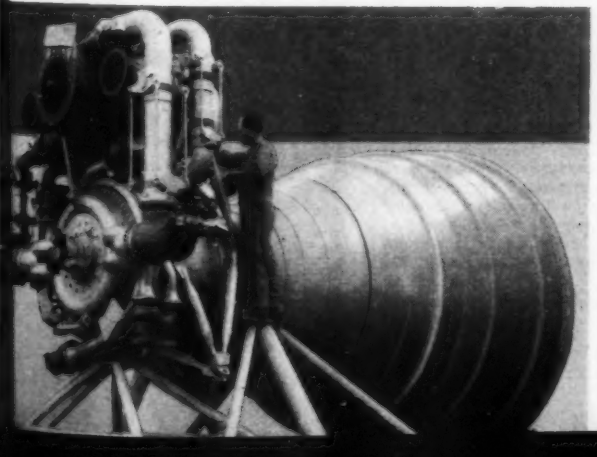
The thrust chamber assembly consists of a tubular-wall, regeneratively cooled chamber with an uncooled extension, a double-inlet oxidizer dome, four integral fuel valves, and a flat-face injector. The cooled portion extends to a 10:1 expansion area ratio. Its approximate measurements are 40in chamber diameter, 9ft 6in nozzle exit diameter, and 11ft length. The chamber is designed for the attachment of segmented, uncooled nozzle extensions to facilitate transportation, and to accommodate any area ratio required by the mission up to 16:1.

Two tons per second of liquid oxygen and nearly one ton per second of narrow-cut kerosene (RP-1) are burned in the combustion chamber. The oxygen usage rate is equivalent to that of 60m people in normal breathing, and in 3sec of mainstage operation, the F-1 uses as much fuel as the average automobile uses in one year. The oxidizer is fed through dual inlets to the dome to ensure even distribution to the injector. It passes through feed holes, and is injected through a pattern of 2,600 orifices into the combustion chamber.

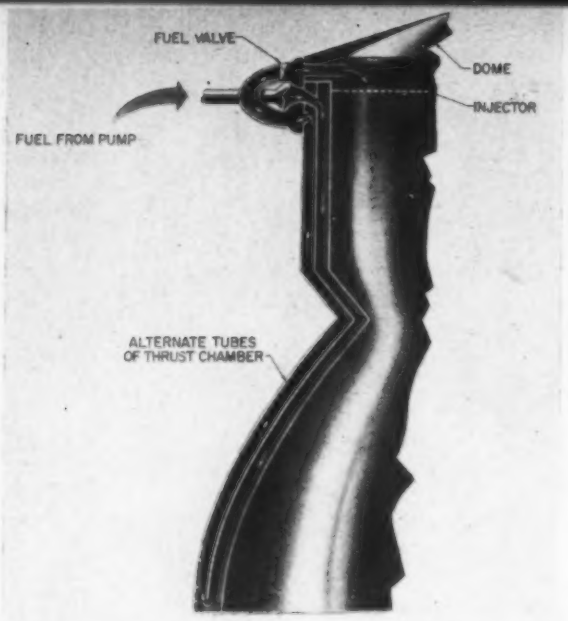
The fuel is also fed through dual inlets to a chamber feed manifold. From here, the fuel flows through alternate tubes the length of the chamber, and then returns to the collector manifold. The flow continues through four fuel valves, spaced at 90° around the chamber, into an injector feed manifold. This distributes the fuel through 32 spokes into the injector, from which it passes through approximately 3,700 orifices into the combustion chamber. The location of the valves downstream of the chamber tubes provides a greater degree of control in timing and sequencing the fuel for engine starting. It also provides a repeatable minimum cutoff impulse.

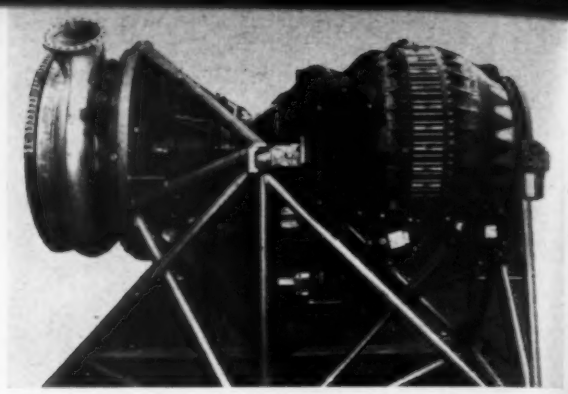
In the interests of simplicity and reliability, the turbopump is a direct-drive unit. The fuel and oxidizer pumps are driven by a velocity-compounded turbine, which at rated conditions develops approximately 60,000 h.p. The assembly is about 4ft in diameter, 5ft long, and weighs approximately 2,500lb. The oxidizer is supplied to the pump through a single inlet, in line with the main shaft, and is discharged radially through dual outlets. The dual-outlet design balances centrifugal loads and minimizes pump diameter. The fuel pump has dual inlets and outlets for balanced load distribution and minimum size.

The gas generator burns about 2 per cent of the total propellants used in the engine. The partially spherical gas generator is approximately 10in diameter. The gas-generator design makes use of a double-wall combustion chamber, through which the fuel flows to cool the body regeneratively. This feature eliminates a hot outer surface which could ignite leaking propellants, and it reduces heat radiation to adjacent components.

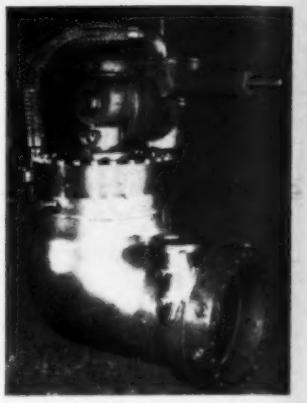


Layout of the F-1 is evident from the full-scale mock-up





Left, fuel enters the thrust chamber at the top and passes through the tubes of which the chamber is made to give regenerative cooling



Above, one of the first large pieces of hardware to be operated was this turbo-pump, seen in its calibration fixture at Santa Susana

Right, the gas generator, the design of which is referred to in the text on the left

Missiles and Spaceflight . . .

Main controls are: four fuel valves, integral to the thrust-chamber assembly; two oxidizer valves mounted on the thrust-chamber dome; a gas-generator valve; a fuel and oxidizer flo wregulator for the gas generator; and a four-way solenoid valve. This solenoid valve is one of the only two components in the engine requiring an electrical supply, the other being the spark exciter for the gas-generator. The fuel, oxidizer, and gas-generator valves use fuel as their actuator medium. The oxidizer and fuel valves are of the poppet type which eliminates the turning moment associated with large butterfly and ball valves, simplifies sealing problems and minimizes bulk.

The major test facilities consist of two engine stands and a thrust-chamber stand located at Edwards Air Force Base. An interim stand for thrust chambers and a turbopump stand are located at Rocketdyne's Santa Susana facility. There, other facilities are available for testing of the gas generator, propellant valves, and other control components.

Early in the programme, injector evaluation tests were conducted on the interim thrust-chamber stand, which had been constructed for earlier Air Force programmes. Owing to the physical dimensions and tank limitations, the tests are restricted to low area-ratio chambers at a maximum of 1,100,000lb for a duration of 5sec. A new thrust-chamber facility has been provided at Edwards, capable of 1,500,000lb level.

The stand requires huge, high-pressure tanks to feed the propellants to the chamber. The tanks are constructed of stainless-steel plate approximately 5in thick, and have control valves that weigh in excess of 6 tons each. It was not economically practical to build these tanks large enough to supply the thrust chamber for durations of more than 20sec. The thrust chamber is mounted in a position 30° below horizontal, which eliminates the need for an expensive flame deflector.

The NASA F-1 contract provided for the modification for turbopump testing of an engine stand constructed for the Air Force at Santa Susana. The stand has three locations for test turbopumps. One is for the pump calibration requirements, and the other two are used for turbopump development tests. Permanent gas-generator installations are used to drive the turbopumps under test, and the piping is arranged to provide any combination of liquid oxygen, RP-1 and water.

The engine test facilities consist of a converted Atlas missile stand, and a new two-position stand, both at Edwards. The new stand, which will be ready for use by summer, accommodates the side-by-side installation of two F-1s, each of which can be tested separately. This structure is approximately an eleven-storey-high complex of heavily reinforced concrete with a girder framework anchored deep in granite. The construction permits the addition of concrete and anchoring structure for testing clusters of F-1 engines.

Thrust Chamber Experience has demonstrated that the injector presents the first major development hurdle. Stable combustion must be attained before injector cooling and other thrust-chamber development problems can be investigated. It seems logical to scale up designs which have proven successful in smaller engines. However, this did not prove to be an easy and quick solution for the 400,000lb E-1 engine, in which it took 18 months to evolve a stable injector configuration.

The F-1 injector test programme got underway within two months of the NASA contract, with the test of full-scale hardware. This was possible because of previous work which provided a test stand and some experimental hardware. Heavy-duty thrust-chamber hardware, which is inexpensive and easily fabricated, was used. A series of water-flow and calibration tests was conducted to determine the start sequence which should be employed for the first hot-firing test. The initial series of hot tests consisted of ignition and transition tests. This is one of the most critical stages in injector development.

Unstable combustion, explosions and other destructive effects occurred in these tests, which ranged from 100 to 500 milliseconds in duration. However, a marginal degree of stability was achieved on the third test and a stable injector configuration was then evolved eight months after the start.

An injector test programme was then conducted for the purpose of evaluating design characteristics which influence combustion stability. The programme included model testing and hydraulic flow studies of injector priming and feed characteristics, as well as full-scale hot firings. Numerous injector tests have been conducted at the 1mlb level or higher; durations have been up to 5sec, the stand limitation. From these tests, two stable injector configurations were evolved. An evaluation programme will result in the selection of the better.

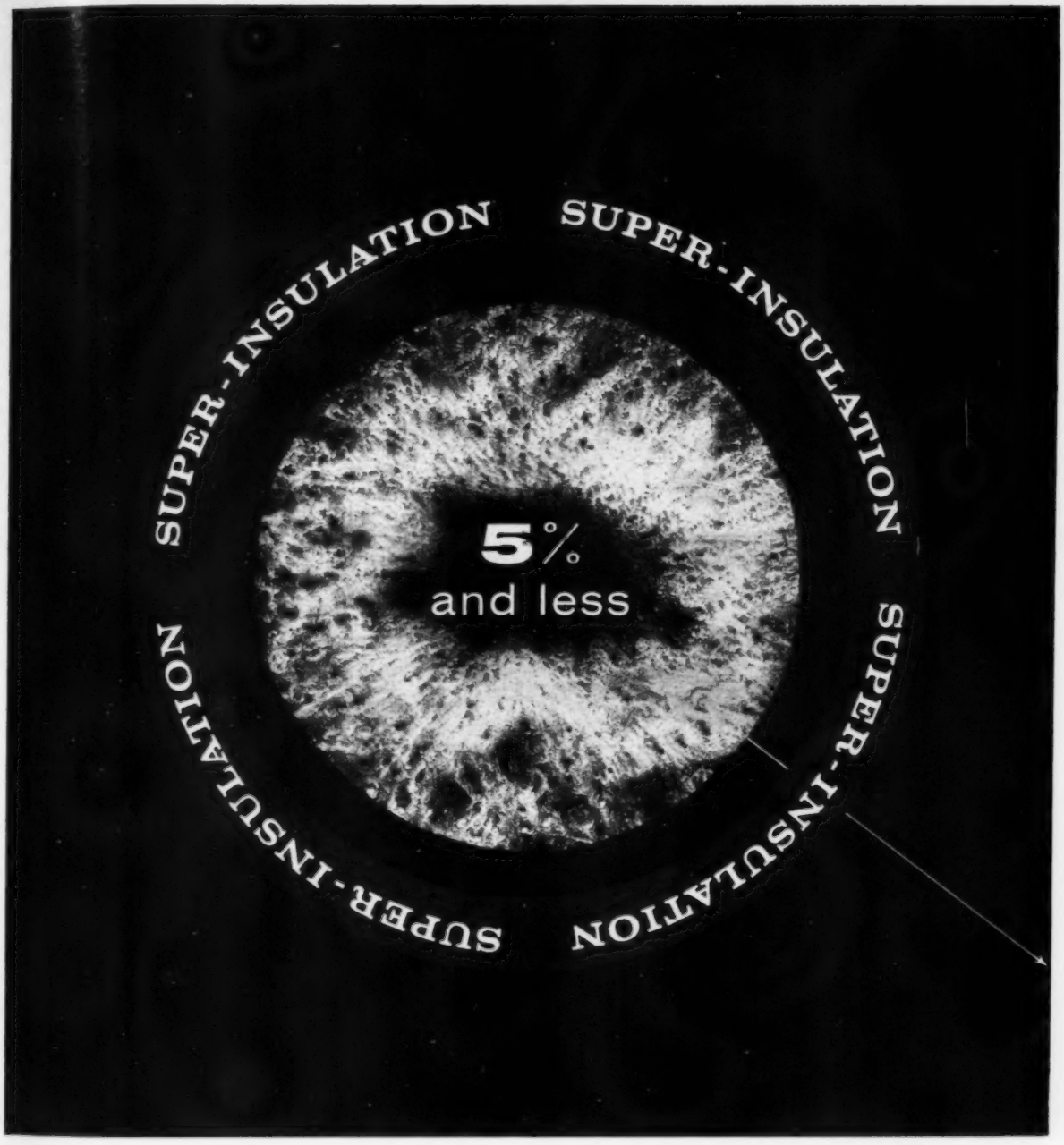
Turbopump The turbopump requires more design and fabrication time than any other component. To evaluate design criteria, an intensive programme of model testing was conducted. Model hardware offers the advantage of short fabrication times, requires minimum facility requirements, and simplifies rework. It has been successfully used to evaluate the fuel pump, oxidizer pump, inducers and turbines from the standpoint of performance as well as durability. Tests of the first full-scale turbopump began in November 1960. The first series of calibration tests is under way.

Gas-generator The second major full-scale component to undergo development test was the gas generator. The tests were started on schedule in March 1960, with a successful short-duration test. Since that date, numerous successful tests have been conducted without failures associated with combustion process. The gas-generator has been tested to the full facility duration capacity of 135sec, and has performed satisfactorily over wide ranges of mixture ratio, temperature, and pressure. Also included in the test series were simulated engine-start sequences, demonstrating suitability of the gas generators.

Controls The control components, including the oxidizer and fuel valves, gas-generator valve, four-way solenoid and gas-generator regulators, are all in development testing. These consist of flow, pressure, timing, and actuation tests. In the first phase of testing, water is normally used as the working fluid. However, development has progressed to the use of the actual propellant associated with each valve.

Engine System The first engine was tested earlier in 1961. The components being assembled into this engine first completed hot firing and bench tests. The first phase of the engine programme consists of short-duration tests, to perfect the engine start and shutdown sequences. These tests are followed by performance, durability, repeatability, and reliability programmes, all designed to prepare the engine for the start of the Preliminary Flight Rating Test in late 1962. The engine, after approximately 18,000sec of development testing, is scheduled to complete PFRT tests in early 1963.

A photograph of one of the "boilerplate" thrust chambers, which preceded tests with the actual engine. One of these uncooled assemblies was the first liquid engine in the Western World to exceed 1,000,000 lb thrust, and reached 1,550,000lb last February



Liquid oxygen will soon be carried in a greater number of RAF and Civil Aircraft than ever before. And one of the major considerations about storing liquid oxygen on airfields for long periods, has been the loss by evaporation • After exhaustive research work, British Oxygen have evolved a highly efficient form of super-insulation for tanks and dispensers. In a 75 litre dispenser insulated in this way, the evaporation loss can be reduced to a mere *1% per day*. In large storage tanks it can be reduced to as little as *5% per year* • For full information about tanks and dispensers incorporating super-insulation, contact British Oxygen Aviation Services.

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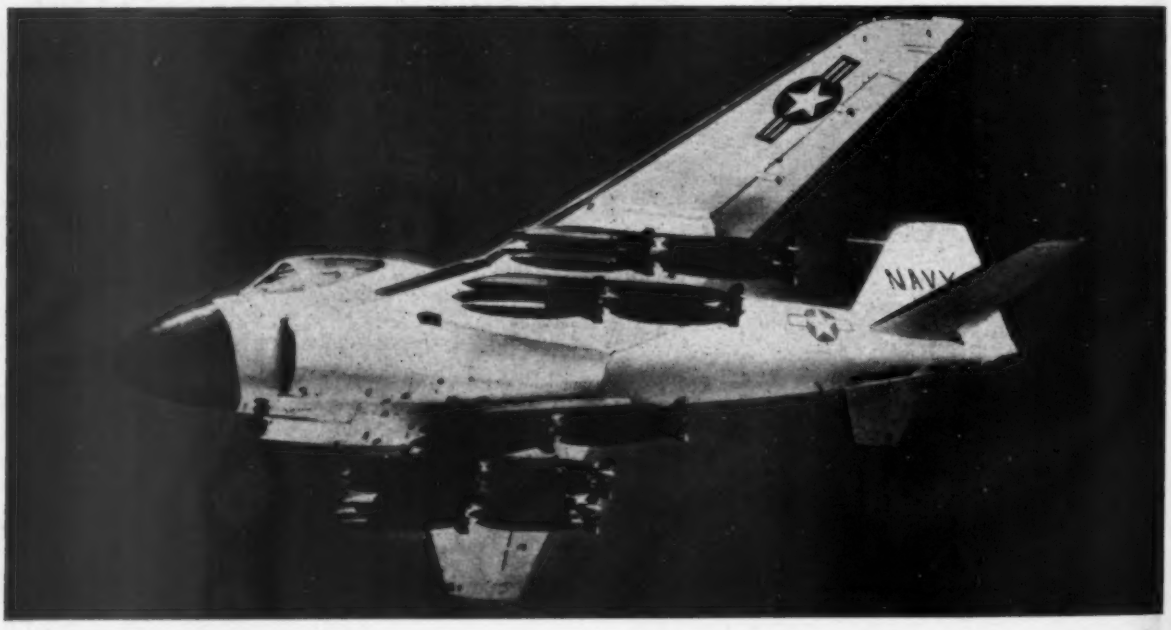
"Air born" of experience in brushfire war...

The A2F-1 Intruder

◀ *Illustration shows artist's conception of Grumman F9F Panther operating in Korea.*

▼ *A2F-1 Intruder with total of thirty 500-pound bombs in clusters of three from wing stations.*



This is the Grumman A2F-1 Intruder attack aircraft—an airborne weapons system developed for the basic purpose of fighting a limited or brushfire war. It was based upon limited war combat experience gained in Korea.

The A2F-1 Intruder "sees" in total darkness, "sees" through foul weather, to search . . . detect . . . track . . . and kill . . . a pinpointed target. Safeguarding our freedom cannot wait for clear weather or daylight. In fact, the crew of the A2F-1 can destroy this pinpointed target in any weather or darkness without ever having to see it.

Operated as an air-to-ground, missile-carrying aircraft, or equipped to carry conventional weapons of all types as well as nuclear weapons, the A2F-1 Intruder provides an all-weather attack aircraft with extended range and heavy weapon capacity. In nuclear attack, the aircraft can come in low under enemy radar . . . too low for effective interference by enemy aircraft and ground fire.

The Intruder provides a new capability in close support missions—provides the nation with a powerful deterrent to prevent war and preserve peace.

GRUMMAN

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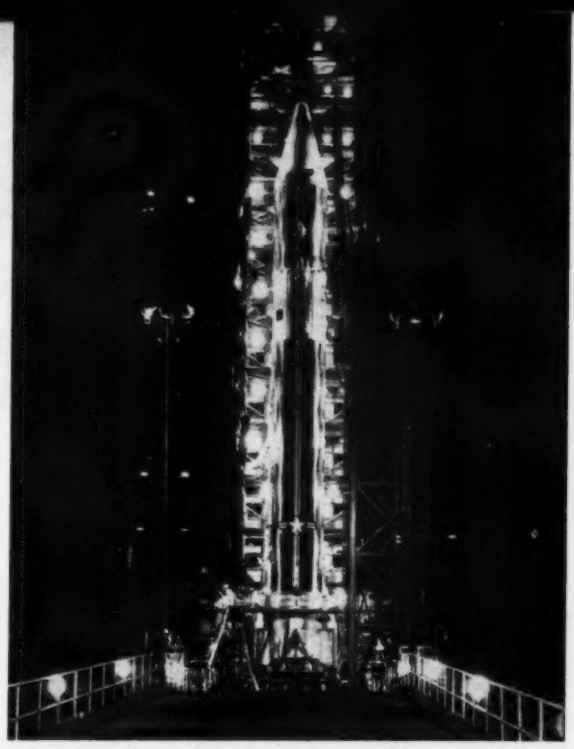


First photograph to show the 105ft Atlas-Centaur space vehicle on its launch pad on Complex 36 at the Atlantic Missile Range, Cape Canaveral, Florida. Both the modified Atlas and the Centaur upper stage are produced and tested for NASA by the Astronautics Division of General Dynamics. The Centaur stage will be the first American space vehicle to use liquid hydrogen; test launchings are scheduled for later this year

Missiles and Spaceflight . . .

SOUTHAMPTON SEMINAR

A one-week seminar on astronautics is to be held at Southampton University during July 12-19. Organized by the Department of Aeronautics and Astronautics of the University in collaboration with AGARD, the meeting will include 20 papers on various aspects of spaceflight by speakers from Britain, the United States, France, Belgium, and Italy, and an official dinner at which the principal speaker will be Mr David Price, MP, who has been the UK reporter to the Strasbourg Conference of the Consultative Assembly of Europe on European space co-operation.

The organizers intend to devote ample time in the programme to free discussion on the topics outlined by the main speakers. The seminar is intended for scientists and engineers whose work involves an interest in the subjects, and also for students about to enter industry or research establishments after graduating in mathematics, science or engineering. None of the proceedings is classified and there is no restriction on attendance. The programme will include an official opening by Mr E. T. Jones, Deputy Director of AGARD, an introductory lecture by Mr M. J. Lighthill, FRS, Director of the Royal Aircraft Establishment, and visits to a number of establishments including the Radio Research Station, Slough; Rocket Propulsion Establishment, Westcott; Royal Greenwich Observatory and the Guided Weapons Department of RAE.

The total cost for the seminar will be £21, which includes accommodation and meals, abstracts of lectures and transport for the visits. Enquiries should be addressed to Dr B. L. Clarkson, Department of Aeronautics and Astronautics, The University, Southampton.

SATURN CHANGES ANNOUNCED

Modifications in the configuration of the Saturn launch vehicle were announced by the US National Aeronautics and Space Administration on June 1. A two-stage Saturn C-1 will be used for the first ten research and development flights, instead of the three stages originally planned. The primary purpose of these first ten flights is to test the vehicle, although on the last four flights "boilerplate" models of the Apollo spacecraft may be placed in Earth orbit as a secondary mission.

The two-stage Saturn C-1 will be capable of placing about 20,000lb in low Earth orbit—approximately the same payload as the original three-stage version. This is caused by two recent modifications: (1) the increased thrust of the second (S-4) stage from 70,000 to 90,000lb by the addition of two engines and (2) a planned increase in the propellant capacity of the first (S-1) stage, beginning with the seventh flight of the C-1.

Under the present schedule each of the first three C-1 vehicles will consist of a live first stage, a dummy second stage, and a dummy third stage for aerodynamic stability. The next three vehicles will comprise live first and second stages only. Flights numbered 7-10, which will launch the Apollo test models, will use vehicles in which the booster tankage will be lengthened from 50 to 56ft, increasing burning time with the addition of some 100,000lb of propellant. These flights will be first to use H-1 engines rated at their full thrust of 188,000lb each. The vehicles, carrying a shorter adapter section between instrument compartment and payload, will be fitted with aerodynamic fins for improved stability and control.

The original third stage (S-5) planned for Saturn will not be used until later in the C-1 programme. While no major S-5 development programme is included in the initial ten-vehicle plan, a limited engineering effort will continue to adapt the Centaur stage for the later C-1 and C-2 flights. S-5, under development by the Astronautics Division of General Dynamics, is powered by two LR-115 Pratt and Whitney engines of 15,000lb thrust each.

NUCLEAR ROCKET TEST PLANNED

The first of a series of Kiwi-B experimental reactors is scheduled to be ground-tested in October this year at the Nevada test site of the US Atomic Energy Commission, marking the start of a new accelerated testing phase in the Project Rover nuclear rocket programme. The programme is being carried out jointly by the AEC and the National Aeronautics and Space Administration.

Hydrogen has been selected as the propellant to be used in future nuclear powered rockets in the US programme. The first Kiwi-B reactor will use gaseous hydrogen, and a test of a similar reactor using liquid hydrogen is expected early next year.

TIROS 2 BETTER THAN PLANNED

The Tiros 2 experimental meteorological satellite completed six months in orbit on May 23 and is continuing to transmit useful data. When launched, the satellite was given an estimated lifetime of about three months, during which time it was to provide global weather observations by means of two television cameras and two experimental infra-red sensing systems. During its first six months' operation a total of 31,485 photographs were transmitted by the television cameras. Of these, 78 per cent of the

These "postal rockets" were displayed for the first time at the "Mesucora" automatic-control and measurement exhibition held by the French Physical Society last month in Paris. Such vehicles have carried mail payloads during trials from Colomb-Béchar, Sahara

As noted in an accompanying news item, GAM-87 Skybolt's final configuration is more attractive than those through which it passed during development. Prime contractor is Douglas Aircraft, propulsion is by Aerojet-General, "Astronertial" guidance by Nortronics and re-entry vehicle by GE

Missiles and Spaceflight . . .

9,488 narrow-angle photographs and 76 per cent of the 21,997 wide-angle photographs were classified as "fair to good" for meteorological analysis.

While both camera systems continue to operate well, one of the infra-red systems failed on April 23, and the other system has suffered a partial failure and is currently only of limited use. NASA expects to launch a third Tiros during this summer, and hopes that the satellite will obtain, in particular, useful information on hurricanes.

NEW SKYBOLT CONFIGURATION

In an accompanying photograph of a mock-up, displayed in Los Angeles during the recent Armed Forces Day, the final configuration of Skybolt is revealed. Comparison with the original aircraft-compatibility dummies, illustrated in our issues of January 13 and 20, emphasizes a number of configuration changes. Aerodynamic drag, a matter of some importance to the cruise consumption of the parent aircraft, is reduced by the new re-entry vehicle, by General Electric's Missile & Space Vehicle Department, which is a simple cone mating smoothly with the second propulsion stage. Instrumentation fairings have vanished, and the eight delta fins appear to have settled down essentially along the lines of those illustrated on January 20.

Although the US Secretary of Defense has expressed his opposition to any further procurement of SAC bombers, development of Skybolt has not been curtailed. Classified testimony by Dr Herbert R. York, when he was director of research and engineering, Department of Defense, six weeks ago, makes it clear that the programme is going ahead rather half-heartedly. Not only is it—quite naturally—being subjected to continuous appraisal in competition with other delivery systems, but Dr York is quoted as saying, "There are doubts about whether it can do precisely what is claimed for it . . ." He went on to answer questions on the programme delays resulting from the fact that the "concept of concurrence" is not being followed in the case of Skybolt. This concept permits the manufacture of hardware in quantity, and the modification of aircraft to carry the missile, in parallel with design work. Dr York suggested the delay would be a little less than a year, but initial operational capability is still scheduled for the winter of 1964-65.

FARNBOROUGH'S WORK IN SPACE

In the field of satellite research the Royal Aircraft Establishment is now concentrating on the design of a communications satellite system for Commonwealth and possibly worldwide applications. Large teams from both the RAE and the GPO are working on this project. This was stated by the director of the Establishment, Mr M. J. Lighthill, FRS, at a press conference at Farnborough on June 8. "We have a great range of new ideas for satellite development and we are working on them," the director said; earlier designs had included astronomical and other scientific satellites.

On the subject of a satellite launching vehicle, Mr Lighthill referred to the work which RAE had done on Blue Streak and Black Knight, and expressed the hope that the proposed European space launcher organization would be set up and would go ahead with the three-stage vehicle using Blue Streak as the first stage. The Establishment was "enjoying co-operating with the French" on the proposed launcher, and at present the joint work was continuing on such aspects as the integration of the separate stages into the single vehicle.

ASTRONAUTICS ACADEMY GETS INTO THE ACT

Yet another international organization has begun a programme of meetings on spaceflight topics. The body is the International Academy of Astronautics of the International Astronautical Federation, and its inaugural technical meeting will be a symposium devoted to spaceflight and re-entry trajectories to be held during June 19-21 in Paris. A total of 16 scientists from nine countries will present papers at the meeting, which will be sub-divided into sections on trajectories for lunar and interplanetary missions, orbital transfer and rendezvous, near-Earth satellites, and dynamics of terminal re-entry.

Among the lecturers will be Mr H. Hiller and Dr D. G. King-Hele of the Royal Aircraft Establishment, Farnborough; Mr T. R. F. Nonweiler of Queen's University, Belfast; and Dr W. F. Hilton of Hawker Siddeley Aviation. The meeting is being organized by the Academy from its headquarters at 12 rue de Gramont, Paris 2.

NASA NUCLEAR-ROCKET CONTRACT

NASA and the Atomic Energy Commission jointly announced on June 7 that negotiations are being opened with Aerojet-General and Westinghouse Electric for a nuclear rocket designed for the propulsion in space of future interplanetary vehicles.

Mr Glenn Seaborg, chairman of the AEC, said that all experiments (chiefly Kiwi A) in the nuclear-rocket programme had so far been successful, and that a complete Project Rover powerplant should be completed in three or four years. The new contract is for the Nerva (nuclear engine rocket vehicle application) powerplant, and will be a first-phase contract lasting six months. At that time designs and costings and an estimated flight schedule should enable the US Government to select a final design for manufacture.

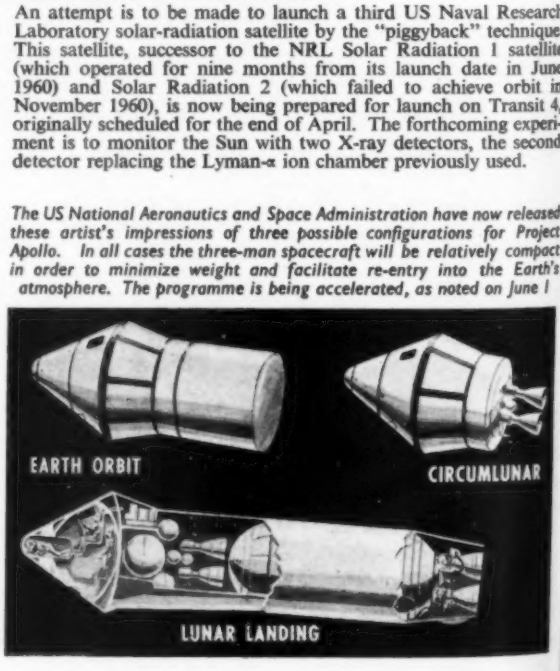
GEC ON SEASLUG 2

On June 8 the General Electric Co Ltd announced that its Applied Electronics Laboratories at Stanmore, Middlesex, have been entrusted with the development of the guidance receiver for Seaslug Mk 2. The existence of this new ship-to-air missile was divulged in the recent Navy Estimates; it will have greater range and speed than Seaslug Mk 1, and will be installed in the two new missile destroyers for which orders will shortly be placed. The GEC announcement goes on to discuss the method of operation of a beam-riding guidance system, but it would be premature to assume that such a system will be retained in Seaslug 2.

SOLAR-RADIATION SATELLITE

An attempt is to be made to launch a third US Naval Research Laboratory solar-radiation satellite by the "piggyback" technique. This satellite, successor to the NRL Solar Radiation 1 satellite (which operated for nine months from its launch date in June 1960) and Solar Radiation 2 (which failed to achieve orbit in November 1960), is now being prepared for launch on Transit 4, originally scheduled for the end of April. The forthcoming experiment is to monitor the Sun with two X-ray detectors, the second detector replacing the Lyman-α ion chamber previously used.

The US National Aeronautics and Space Administration have now released these artist's impressions of three possible configurations for Project Apollo. In all cases the three-man spacecraft will be relatively compact in order to minimize weight and facilitate re-entry into the Earth's atmosphere. The programme is being accelerated, as noted on June 1



Digging-in while a Beverley takes off from the airhead strip: a scene from the airborne assault demonstration on Salisbury Plain on June 7

ON Salisbury Plain on Wednesday and Thursday of last week there was held the first large-scale land-air warfare demonstration by all three fighting Services. The Royal Navy contributed Scimitars, Sea Vixens and Sea Venoms in a ground-attack rôle. The Royal Air Force deployed Hunters and Canberras for ground attack, Beverleys and Hastings for troop transport and supply-dropping, and Pioneers and Whirlwinds, Belvedere and Sycamore helicopters for short-range tactical transport. The Army demonstrated its fire-power and supplied elements of 16 Parachute Brigade for an airborne assault, followed by an air landing by units of 51 Infantry Brigade Group supported by the RAF Regiment.

There were four phases in the demonstration. "Noisy Nora," on the Wednesday morning, concentrated on fire-power and was held at the School of Artillery ranges, Larkhill. "Saucy Sue," at Larkhill that afternoon, simulated an airborne assault; "Plain Jane," on Thursday, showed the advance and engagement of a brigade group, with Honest John deployed; and "Pretty Lily," at RAF Boscombe Down during the day, was a static show of RAF and Naval aircraft and their operational loads, plus a display of the organization employed by 38 Group, Transport Command, in the control of an air transport force in land-air operations.

The fire-power demonstration ranged from hand-held infantry weapons to rocketry and dive-bombing by Canberras. It brought in Wombat and Malkara and also the new mark of Canberra, the Mk 15/16 (B.6 variant), participating by permission of the MoA. Two of these aircraft each fired 128 2in rockets. Wombat, designed to be carried on a vehicle (at present a long-range Land-Rover) was described as having a maximum range of 1,200yd, but with a greater chance, at shorter range, of getting a first-round hit. Malkara was not fired, owing to an electrical fault in the system; it had worked perfectly at rehearsal the day before.

Air-to-ground firing was provided by two of the latest generation of Naval aircraft, the Scimitar and Sea Vixen, and one of the obsolescent generation, the Sea Venom; by Hunter FGA.9s and the Canberras already mentioned, while six Canberra B(I).8s of 16 Sqn, RAF Germany, carried out shallow dive-bombing with two 1,000lb practice bombs and cannon-strafing with their four 20mm Hispanos before leaving for their home bases. The Sea Vixens likewise flew home after demonstrating—back to Yeovilton. Two of them carried out attacks with 2in and 3in rockets. The Scimitars did 20° rocket and strafing attacks; they were unable to bomb because cloudbase in the target area was insufficient. The Sea Venoms, which also returned to Yeovilton after demonstrating, operated in two four-aircraft groups; each had 12 3in rockets and did a second attack with their four 20mm cannon. There were eight Hunter FGA.9s, all from No 54 Sqn at Stradishall: on the first run, two of them carried out bombing attacks, six rocketry; on the second they did strafing with their 30mm cannon.

"Saucy Sue," on the Wednesday afternoon of June 7, was a tactical and logistic display. It began with a typically open part of Salisbury Plain (for the purpose of the exercise, a piece of foreign territory at odds with the Foreign Office) which by the end of an hour-and-a-half was thickly populated with soldiers, supplies and aircraft. As the commentator put it, they were "having to squeeze the events of many hours into 90 minutes." Operations began with nine Hastings (from Colerne) and four Beverleys (from Abingdon) of 38 Group dropping elements of 16 Parachute Brigade Group to secure an airhead: the Hastings carried 30 parachutists, the Beverleys 20 plus two platforms; they were given fighter cover by RN Scimitars, six of which subsequently attacked an enemy target under fire control directions from the ground. Conditions were not easy for the parachutists, with a wind freshening to 18kt.

The operation's second stage was the flying-in by Beverleys to a strip on the airhead of elements of 51 Brigade Group. (This airstrip had actually been constructed a few weeks ago, similar to the one laid down in Norfolk by parachutists who were dropped with their equipment.) Four Beverleys were actually employed, the first of them taking off again after only 12min; the commentator stressed that it should be imagined they were "coming in continuously." Next came the Pioneers of 230 Sqn, in green-and-blue camouflage, flying in and out at treetop level; then Sycamore, Whirlwind and Belvedere helicopters. (One additional Whirlwind was used on an actual casualty evacuation, three parachutists having been injured in the descent.) The four Sycamores carried four soldiers apiece, the three Whirlwinds eight apiece (deplaning by rope), and the two Belvederes had a mixed load: one carried 25 troops, the other a jeep and trailer slung beneath it. The Whirlwinds also used external loading when they took off on sorties out of the airhead. A DHC-4 Caribou which landed with about 30 soldiers (it was CF-LAN, the demonstrator seen at the recent Paris Salon) was supposed to fly casualties out of the airhead. As there were none, it simply took off from where it stood on the strip, with a run of about 100yd.

Assault and Fire-power

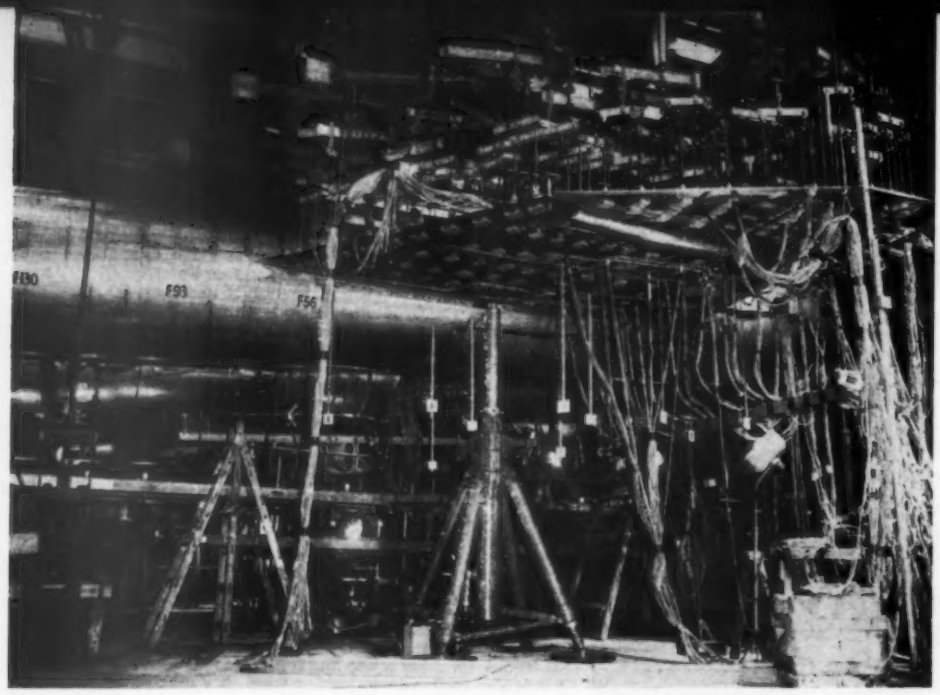
COMBINED SERVICES' POTENTIAL DEMONSTRATED

On Thursday, in "Pretty Lily" at RAF Boscombe Down and "Plain Jane" at Larkhill, the Royal Air Force and the Army respectively showed a line-up of their weapons and aircraft. There were also, at Boscombe Down, four Royal Navy types of aircraft, including the Buccaneer and Wessex, which were on show by arrangement with the MoA. Also there by arrangement with the MoA was an Armstrong Whitworth Argosy C.1, one of 56 ordered for RAF Transport Command. The Army armament on show included Honest John, the free flight missile, which was twice fired successfully, the Army having more luck with this than they did with Malkara the previous day. Thunderbird was also on parade.

These demonstrations on Salisbury Plain were attended by a large number of officers from the British and NATO services, headed by the Chief of the Defence Staff, Admiral of the Fleet Earl Mountbatten of Burma.

When "Saucy Sue" ended the military band broke into "Rule Britannia," perhaps in compliment to Lord Mountbatten's naval antecedents. It might also have been interpreted as emphasizing his consistent support, from the war years onwards, of combined operations such as had been demonstrated before the large crowd of officers, Ministry officials, cadets and other spectators.

Types of aircraft involved in "Saucy Sue": Beverleys, a Whirlwind with externally slung load, and a Prestwick Pioneer



Last August 19 this journal published an account of some of the many severe fabrication problems encountered in the Bristol 188 programme. Several of the steel airframes have now been completed; one is to fly during the next few weeks and another has for some months been at the RAE for static testing, both with and without simulated kinetic heating. The fuselage-like tube in this photograph is the port engine nacelle

Farnborough on Show

"FLIGHT" PHOTOGRAPHS

WORLD-FAMOUS as the site of the annual SBAC Exhibition but relatively modest about its own activities, the Royal Aircraft Establishment at Farnborough opened its gates to several thousand invited visitors on June 9 and 10 at the Establishment's first Open Days since the jubilee occasion of 1955. As the photographs on these pages indicate, there was much to interest the fortunate visitors, whose main problem was the near-impossible one of selection from the embarrassingly rich variety of exhibits on display.

An overall guide to the Establishment's work was presented in the form of nine review stands in the main concourse just behind Cody's tree. These were devoted to organization, transport aircraft, military aircraft, space, weapons, equipment, general research, tools for research, and engineering services. Detail was filled in by specialized exhibits in the various departments, and each day was rounded off with a flying display showing some of the hard-working aircraft types used in flight research. Among these aircraft was the two-seat Avro 707C delta, which is now being used in the development of an electrical control system. The rebuilt S.E.5A also flew.

A test specimen of the Bristol 188 airframe was on view in the "Cathedral" test frame of the Structures Department. At present the static strength of the aircraft structure is being tested with the structure unheated, the flight loads being applied mechanically. In subsequent tests this loading will be combined with simulated kinetic heating, using banks of infra-red radiant heaters.

A short length at the end of the 2,000ft high-speed track was used in a demonstration of a 6g deceleration of a rocket-propelled sled carrying two airline-type passenger seats. The object of this dynamic crash test was to measure the loads in the seat structure.

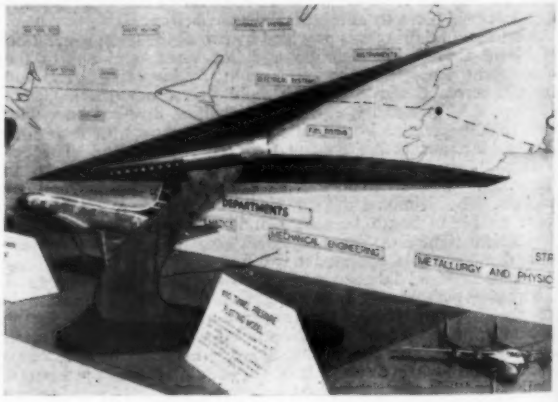
Among the Guided Weapons Department exhibits were items depicting Blue Streak, Black Knight and Skylark developments. In the main concourse, the "space" stand included models of an astronomical and a communications satellite described as "possible designs," a full-scale model of the second stage and re-entry head assembly in the two-stage version of Black Knight, and a model of the Skylark launcher installed at Woomera. Outside one of the GW Department buildings were two rockets—a two-stage Black Knight and a Skylark fitted with a Cuckoo boost motor.

Skylark exhibits also included a fully instrumented Skylark head identical to that of Skylark No 43 which carried stellar ultra-violet light measuring equipment; a working model of the servo-controlled roll-stabilization of the nosecone; and some of the methods employed in determining the attitude of the rocket with reference to the Sun and to the Earth's magnetic field. Test rigs for sensitive jet control systems such as those for Skylark and for other rocket and satellite applications were demonstrated.

The one-tenth scale model of a possible version of the three-stage European launcher shown at the Paris Salon was on view, together with models showing the Woomera launcher area and the initial trajectory of a satellite launched in a northerly direction from Woomera (*Flight*, 17 February 1961).

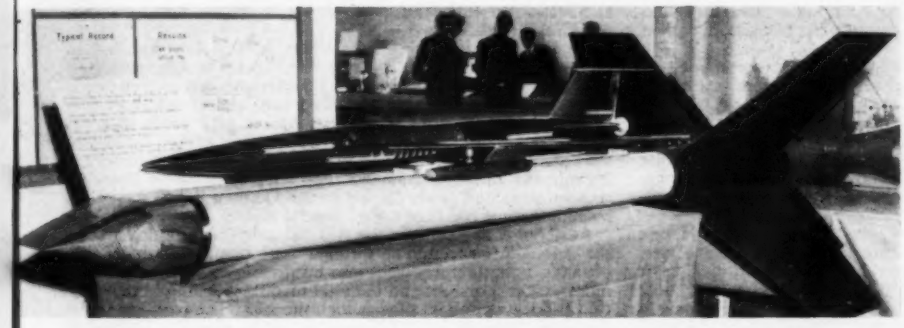
The Aerodynamics Department showed a number of rocket test

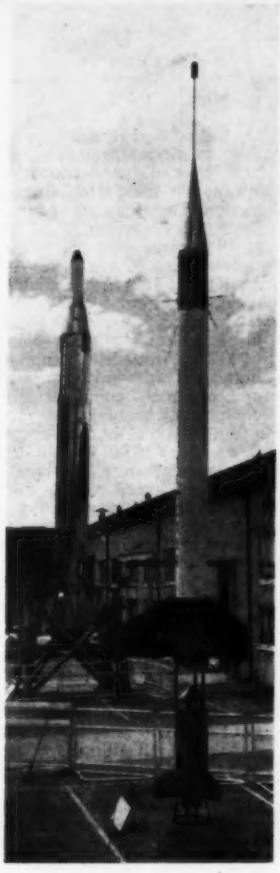
The supersonic-transport model on the left is released from a booster rocket at 2,000 m.p.h. (M2.5 at low level), and during the subsequent coasting flight is subjected to sudden disturbances by the tiny rockets in each wing. On the right is a pressure-plotting model of a slender high-aspect-ratio design studied some years ago as a possible supersonic transport; it was made at RAE Bedford to prove the expected low drag at the design condition



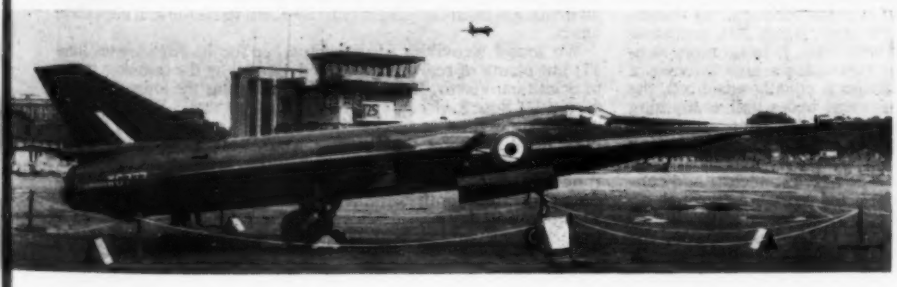
Not previously exhibited, the three-stage Jaguar above is designed for heat-transfer work at up to M10. Above right, is a general view of the space display in the main concourse (with the Black Knight second-stage and re-entry head assembly described in our September 16, 1960, issue prominent in the foreground). On the right is seen a two-stage Black Knight and, nearer the camera, a Skylark with Cuckoo booster

The accompanying text describes the "piggyback" vehicle illustrated below. Twin solid motors are used to accelerate the free-flight model to supersonic speed, after which separation takes place. The model appears to be related to that illustrated at lower left on page 569 of our April 27 issue





The two Fairey FD.2 aircraft are being used for various investigations into wing forms and propulsive nozzles. One (WG777) was displayed in the static park at Farnborough; note the Hunter approaching to land



vehicles used for aerodynamic research at transonic, supersonic and hypersonic speeds using free-flight techniques. These included the three-stage solid-propellant Jaguar hypersonic vehicle, which has been developed to investigate aerodynamic phenomena at speeds up to M10. This is a joint programme by RAE and the aerodynamics division of the Australian Weapons Research Establishment.

Another booster rocket shown was used to accelerate a dynamic stability model of a possible supersonic transport design to a speed of M2.5, after which small impulse rockets in the wing would be used to impart sudden disturbances during coasting flight and so enable the stability characteristics of the design to be studied. Another test vehicle was one of a series being used to investigate the physics of aerodynamic heating at supersonic speeds. A speed range from M2 to M3 is covered, with temperatures and pressures being measured at various points throughout the flight.

Under the heading "aerodynamic efficiency" an interesting "piggyback" vehicle was exhibited. This comprised a model designed to investigate the drag produced by installing engine nacelles on a swept wing, mounted on top of twin booster rockets. The model separates from the rocket motors at M1.5, and fuselage-mounted instruments measure values of drag and pressure at 12 points along the wing root. A telemetry transmitter aerial is mounted in the fin, and Doppler transmitter and receiver aerials in the port and starboard wing trailing edges.

An investigation of the low-speed characteristics of the slender-delta configuration was illustrated by a quarter-scale free-flight model of the HP.115, made of moulded glass-fibre shells stiffened internally with balsa wood. Models of this type are towed to a height of 4,000ft by helicopter, released for the period of gliding flight during which measurements are taken, and recovered by parachute.

An ingenious navigational aid was shown by the Instrument and Photographic Department. This provides a display for pilot or navigator showing the ground position and track of the aircraft superimposed on the projected colour image of a half-million or one-million scale map. At the larger scale a circular area of about 45 n.m. diameter is displayed. This instrument was first flown in February 1960 and, after successful flights in this country, longer flights up to 1,500 miles were made in Europe.

Other exhibits from which visitors were able to choose ranged from the Comet used for VLF navigation experiments to breeding jars for fruit flies (*Drosophila melanogaster*) used in windscreen-smear experiments. This exhibit included a photograph of a singularly unfortunate housefly disintegrating in an air blast of 550ft/sec.

The Phantom crew were welcomed by US and RN "top brass"; the pilots (far right) were Lt Cdrs Taylor Brown and William F. Fraser. The photograph at the bottom of the page shows the A3J (left) and F4H at Le Bourget

HOT SHIPS AT "HERON"

"FLIGHT" PHOTOGRAPHS

AS described in the June 1 and 8 issues of *Flight*, US Naval participation in the 24th Paris Salon was extensive. The bulk of the aircraft involved flew up from USS *Forrestal*; but the two most interesting were types not yet in full operational service. These aircraft are the McDonnell F4H-1 Phantom II and the North American A3J-1 Vigilante; and last week both visited HMS *Heron*, as presently related.

The Phantom is a carrier-based all-weather fighter, manned by a pilot and a radar intercepter officer seated in tandem. Although it can carry more fuel than any other fighter—2,665 Imp gal—and is appreciably heavier than most World War 2 bombers, its two General Electric J79-2 or -8 engines confer a top speed of the order of M2.4. Armament comprises six Sparrow 3 missiles, a larger number of Sidewinders, or nuclear or conventional attack weapons; and extremely comprehensive detection, tracking and guidance equipment is installed.

Built by McDonnell Aircraft Corp in St Louis, the F4H first flew in May 1958. During development testing at Patuxent River, development aircraft established a world altitude record of 98,557ft and world speed records for the 100km closed circuit (1,390.2 m.p.h.) and 500km closed circuit (1,216.78 m.p.h.). Last May 24 fully operational Phantoms established a new transcontinental record of 2hr 47min over the 2,445.9 miles between Ontario, Cal, and Brooklyn, NY.

The Vigilante is a carrier-based bomber, manned by a pilot and bombardier navigator seated in tandem. Although its dimensions are larger than those of the Phantom (span, 50ft, compared with 38ft 5in; length, 70ft, compared with 58ft), it has a more slender appearance, and with identical powerplants also achieves a Mach number in excess of 2. Its design is equally advanced, the structure, systems and military equipment being unlike anything yet operational in Britain. It carries no defensive armament, but its mission versatility is extreme, supersonic performance being possible at all altitudes down to sea level and manœuvrability being equal to that of most fighters. The heaviest nuclear and conventional stores can be carried, and ejected rearwards through an orifice between the afterburner nozzles.

Built by North American Aviation's Columbus Division, the Vigilante first flew in August 1958. It is now on the home stretch in its extensive evaluation and test programmes; last August it successfully passed its carrier-suitability trials aboard USS *Saratoga*, it has since operated from *Midway*, *Ranger* and *Independence*, is being issued to the heavy attack wing training squadron VAH-3 at Sanford, Florida, and is scheduled to achieve full operational service early next year.

On May 21, Patuxent River's Service Test Division sent an example of each aircraft to Paris. They were accompanied by a Lockheed GV-1 (Hercules) of the US Marine Corps, which carried supporting equipment and air-fuelled both aircraft off Newfoundland. A landing was made at Lajes, Azores, after which there was a direct leg to Le Bourget. The aircraft were parked throughout the Salon until the final weekend, when each made fast passes and Immelmann turns. On June 5 they hopped across to Bonn, for presentations and static display to the German Air Force. Then, on June 7, these two "hot ships" came to Britain.

At about 3.30 p.m. BST the A3J did a dry take-off, followed by the F4H. After climbing through foul weather to more than 40,000ft, both aircraft "went into burner" for a race to a point 20 miles west of London: and the F4H made it in 23min from brakes-off (712kt), two minutes faster than the A3J. The pair then flew in company down to RNAS Yeovilton (HMS *Heron*). Although in Paris we had talked with both crews—Lt Cdr Taylor Brown and Lt H. L. Monroe for the A3J, and Lt Cdr William Fraser and M/Sgt Carl Myers, USMC, for the F4H—we were happy to accept an invitation from the US Navy to fly down to *Heron* and meet them again.

We found Yeovilton busily preparing for its Air Day on June 17; but plenty of real work was being done, as the ceaseless traffic of Scimitars, Vixens, Venoms and Gannets (plus the lodger Valiants of No 90 Sqn RAF) bore cacophonous witness. When the two visitors showed up as specks above the Somerset hills they were at once identifiable by their smoky trails. Both were talked down together by the precision approach radar, arriving on the 6,000ft runway with a 30sec separation. The F4H streamed a colourful drag-chute, but both aircraft can comfortably land in 5,000ft. The following day a visit was paid to the RAE Bedford, but by the time this issue appears both the hot ships should be safely home at "Pax River."

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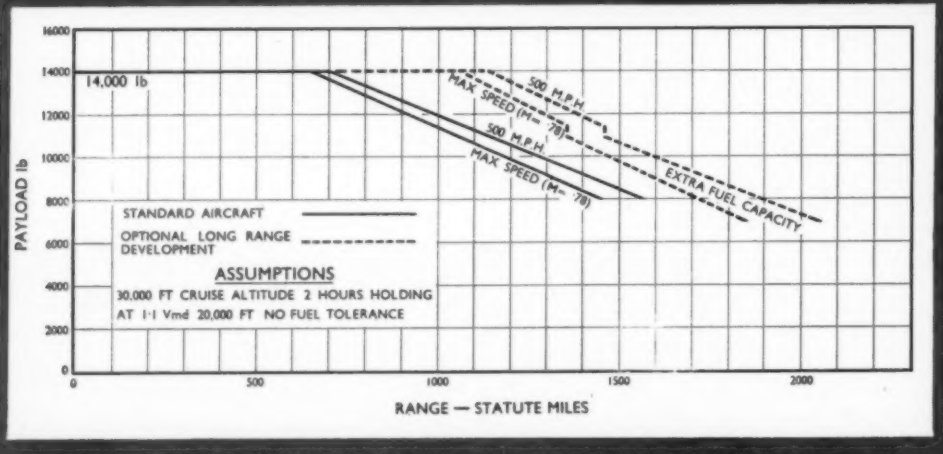
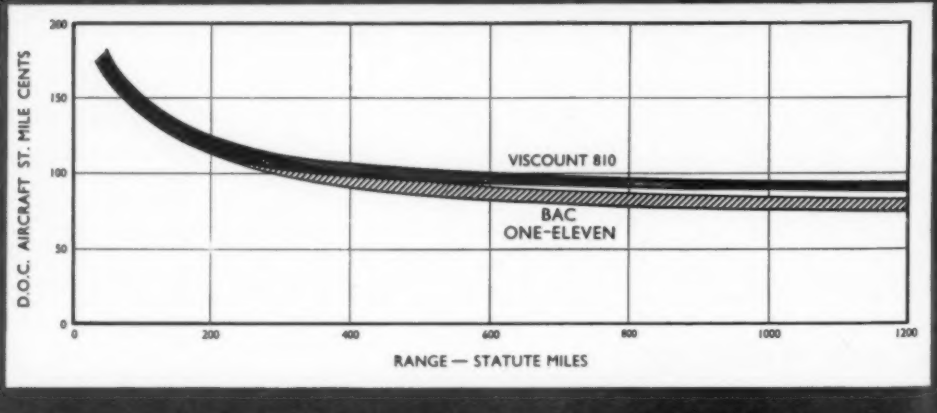


ECONOMICS



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A THREESOME OF CHOPPERS

Flying the Agusta-Bell 204B, Kaman H-43B Huskie and Sud Alouette III

BY MARK LAMBERT

Agusta's Bell 204B, powered by a D.H. Gnome free-turbine engine, has accommodation for ten, comfortable furnishing and large side doors. All inspection panels are of glass plastics

ALTHOUGH I have at one time and another got my hands on well over 100 fixed-wing types of many shapes and sizes, my helicopter experience was rather limited when I reached the Paris Salon this year. Westland and Bristow provided a Widgeon conversion last year and, at the Hanover air show in March I had a frustrating attempt to cope with the ultra-sensitive Sikorsky S-62. Later still I enjoyed a very satisfactory jaunt up and down the Thames in the Hiller 12E. Le Bourget, of course, was one long threshing, grinding and howling of helicopters and I therefore got into the act as best I could. The result was a valuable trio of very different helicopters which taught me a great deal about the various solutions which designers have proposed to the still-unsolved problem of making a good, smooth, stable helicopter. It used to be hard to fly: it is still extremely hard to design.

In the early stages of learning to hover the trusty Widgeon, with a control sensitivity I had not previously experienced in fixed-wing types, I gained the impression that there was a basic trick to be learned, namely, co-ordination of collective-pitch and throttle and the balancing of these against height and power demands. For a while I thought I would never learn it, and then it all fell into place. After further practice I began to be able to fly around and look out of the window instead of instrument flying on the r.p.m. gauge. Having mastered the basic procedure, I was then taught that there were numerous little corners into which one may be forced and from which one must know how to escape—rather like learning about stalling and spinning in fixed-wing types.

There was blade stall, resulting in sharp nose-up pitch and buffet at high speeds and high g-loadings. There was vortex ring which led to partial loss of control during a very slow vertical descent under power. There was over-pitching at the hover which resulted in an undignified and potentially disastrous sink into the ground. There was the ever-present problem of engine failure and autorotational landing. In the unlikely event of loss of engine power the collective-pitch lever had to be put right down within seconds if safe r.p.m. were to be maintained. The descent in autorotation was pretty steep and the round-out had to be achieved with the relatively small kinetic energy left in the rotor—you had to flare-out exactly right so that you touched down before the r.p.m. died away below limits.

Finally there was that operating envelope known as the dead man's curve—which is not nowadays as desperate as it sounds. To make an autorotational landing you must either have sufficient height to achieve a stabilized descent before flaring out or sufficient forward speed to achieve stable autorotation in more or less level flight.

Immediately noticeable in the Agusta Bell 204B cockpit are the duplicated blind-flying panels and the central console devoted to radio equipment. Two columns of engine gauges are just inboard of the six instrument groups and radio bearing indicators. Note the numerous switches on the cyclic and collective hand-grips

You can plot two curves of height against speed which will define the zone of heights and forward speeds at which allowance can be made for engine failure. That is the dead man's curve and its actual shape depends upon the individual helicopter.

In routine flight, I found rudder control, for balancing transmission torque and maintaining direction, a constant task; and the machine was unstable in pitch and roll in such a way that I spent my time catching it as it strayed away from the theoretically trimmed attitude. All this applies in varying degree to every helicopter ever made. That is just the nature of the beast. You can fix one end of the snag range and simply accentuate another. You rarely get away with a completely clean bill of handling health. The Widgeon was certainly no worse than other helicopters of its day and I am extremely glad to have been converted on it, because I feel that I know what the basic problems are. Once I had begun to understand the trick of flying helicopters, I enormously enjoyed the achievement of hovering and manœuvring at very low speeds. A very simple aeroplane can become extremely boring.

The S-62 was the only aeroplane of any kind which I could not even fly straight and level in the cruise. Experienced German army Sycamore pilots took time to get used to its extreme lightness and sensitivity. But the Hiller 12E showed me that built-in throttle co-ordination on a piston-engined type was possible and that the stabilizing devices like the Hiller paddles and Bell bar were a considerable help, but not a complete answer, in overcoming short-term instability.

And so I came to Paris, keen to get my hands on all those turbine-engined types, but diffident about my limited experience. This is a summary of what I discovered by listening and watching and then by flying myself.

The first type was the Agusta Bell 204B, the very first to be powered by an exported de Havilland Gnome free-turbine engine. It looked very smart in blue and white and was luxuriously furnished

These two pictures show the many singular and distinctive features of the Kaman H-43B Huskie rescue helicopter for the USAF

A THREESOME OF CHOPPERS . . .

for about ten occupants, with comfortable seating, carpets and sound-proofing. All access panels and tail shaft fairing were made of glass plastics: radio and instruments were all accessible through a single panel in the nose. Full dual control and blind-flying instrumentation were provided, together with a long console for radio equipment between the pilots' seats. A skid undercarriage was fitted.

In flight, the 204B proved to be the smoothest, quietest and most nearly hands-off machine of the three I flew. Irv Franklin, the Bell pilot, took me up with several other passengers and showed how the 204B handled. The rotor was governed and turned almost constantly at between 290 and 310 r.p.m., with an output shaft speed between 6,200 and 6,600 r.p.m. The governor regulated fuel input to the engine so that no throttle co-ordination was needed once the transmission had been set at the required speed. Franklin said it was impossible to exceed the maximum j.p.t. by over-fuelling, even on a hot day. The main limiting factor as far as power was concerned was the maximum of 780 h.p. which the pilot was allowed to take out of the engine. More was available and there was no gate or stop, because the full 780 h.p. had to be available up to what might be termed the full throttle height. The actual power being used at any given time was indicated by a torque meter red-lined at 340lb/sq in.

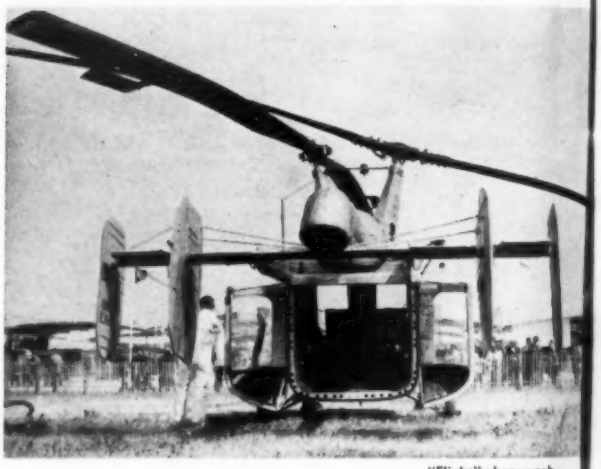
In the Widgeon there was a limiting boost, but one had to juggle the boost and r.p.m., actually working to balance the one against the other, in order to derive some indication of the power margin remaining beyond hovering power, that is, the ability to continue the flight or not under any given circumstances. On the Bell 204B, the torque meter gave instant indication of power being consumed without any juggling to arrive at a correct assessment. In fact, the full 780 h.p. allowed a 1,000ft/min vertical climb at full load and the margin for all normal work was more than ample. Over-pitching was therefore also hardly a problem, especially in view of the constant-speeding of the rotor system. I do not know how the Bell fares, but in the Hiller 12E there was even enough power to climb out of vortex ring conditions. A generous margin of power and constant speeding therefore take most of the possible "corners" out of normal operation.

Having explained these points, Franklin launched out into the countryside around Le Bourget and had a look round. We moved along at about 110 m.p.h. and Franklin trimmed the Bell to fly hands-off, which it did quite happily for a surprisingly long time. He even managed to get it to maintain a shallow angle of bank for a few seconds. About autorotation, Franklin said that he had on occasions cut the power and kept the collective lever at the cruising setting until r.p.m. dropped to 220 after 7 or 8sec. Then the collective was pushed fully down and the rotor r.p.m. went straight back to 300. The skid undercarriage was suitable for run-on landings at quite high speeds, so that the flare problem was much reduced.

After a few minutes Franklin made me take over at about 100 m.p.h. The Bell felt light and surprisingly stable. The stabilizer bar is mounted above instead of below the rotor on this machine and stability has considerably improved. Cyclic-control response was also light and progressive, without the tricky feel of direct powered control on some other types. Directional control was very light and called for small pedal movements, but did not seem over-sensitive. The machine was certainly easy to fly in forward flight, and the slight loss in control response caused by the interposition of the stabilizer bar between pilot and rotor was if anything a help.

I had to let down about 500ft at one point, and as the speed increased to 120 m.p.h. the Bell became distinctly rougher and a ventilator intake began to make a considerable noise. Otherwise noise level was reasonable and there were few vibration periods. The instrument layout was clear and tidy and the deep, wide windscreen gave good forward view. Sideways and up and down, the field was more restricted than in many machines.

If the Bell is a straightforward, comfortable transport machine, the Kaman Huskie which I next flew is a highly specialized helicopter well endowed with curious features. Power is again a free turbine (Lycoming T53-L1) from which 725 of the available 850 h.p. may be "pulled" by reference to the torque meter. The teetering, two-blade rotors constant-speed and intermesh and are controlled by servo-tabs which twist each blade about its fixed root. All torque is cancelled out in the contra-rotating rotor system so that the rudder pedals, acting on aerodynamic rudders on two of the four fins and on asymmetric cyclic-pitch control, need only be used for changing direction. This means that the machine can be taken from full-power climb to autorotation without, in theory, touching the



"Flight" photograph

rudder pedals. In fact, the Huskie is directionally relatively unstable in cruising flight and has to be positively held straight as it tries to wander into a yaw one way or another. But because the directional control is largely aerodynamic and not as sensitive as a tail rotor, it is quite easy to "nail the nose on course" with occasional application of a stout boot.

Rotor disc area is large and the lift per engine horsepower large, so that the Huskie performs well at height. Blade stall has never been encountered, even during the record lift of 1,000kg to 25,000ft. Rotor speed is low, at 236 r.p.m. All this makes for a very good lifting helicopter, but at some sacrifice in forward speed capability. The Huskie is red-lined at 105kt and normally flies at about 80kt, but a large part of the military acceptance tests were successfully completed at 130kt.

The Huskie has probably been seen with as many different fins as any aircraft, but the configuration shown above is final. It consists of four fins, two of them with rudders, mounted on a fully tilting tailplane with liberal wire and rod bracing. The tailplane is freely hinged, but a large servo-tab is connected to the collective stick so that tailplane angle is adjusted as a function of power. The object is to provide normal longitudinal stability in forward flight. Two spring tabs bracketing the geared tab act as blow-down tabs to provide further reaction to power changes. The tail-pipe of the turbine is also carried right back aft of the elevator and considerably turned down, presumably for similar reasons. An interesting feature was that the main-rotor tabs could be trimmed and the blades tracked in flight.

I flew in the Huskie with Mr Newton, the Kaman test pilot. He started the turbine by pressing one button and then releasing the rotor brake and winding up into the constant-speed range. A strong once-per-rev vibration set in and remained with us constantly through the flight. Newton remarked that the torque meter was the best instrument ever given to the helicopter pilot and that a given torque setting would lift a given load anywhere. We ambled shakily out into countryside east of Le Bourget once more, making 75kt. Newton throttled back the engine, held the collective lever up and we just slid slowly down with the rotor r.p.m. settled at

80 per cent (the gauge was marked in this way) instead of its average powered 90 per cent. Having shown the propensity to wander directionally, Newton engaged a directional autostabilizer which "nailed" the Huskie to a heading regardless of bank. Application of bank in fact simply caused a side-slip and a good deal of rudder, ahead of bank, had to be applied to force the autostabilizer round onto a new heading.

With directional autostabilizer and the gadgets at the tail, the Kaman is really pleasant to fly and Newton said he had done fixed-wing type GCAs right down to the ground. The wheel undercarriage is suitable for run-on landings at up to 100kt and the metal paws surrounding the wheels allow the helicopter to remain surfaced in marshy ground where a man would sink in. At 70kt, Newton cut power, reduced collective pitch and made what was virtually a fixed-wing approach, round-out and float, applying power again just as we were about to land in a field. Normally there is enough energy in the rotor for a comfortable zero-speed touchdown without power.

When I took over I found the Huskie very heavy to fly, with some feed-back from the rotor and quite heavy spring feel. Trim adjustment was needed after changing attitude. I also saw how the machine was inclined to wander directionally, but had no great trouble keeping it straight. It was a gentlemanly wander. With stabilization, a good hoof of rudder put it into a steady turn. I speeded up to 100kt by leaning the Huskie forward and pulling increasing power. It became directionally a great deal more sensitive and felt as if it were working pretty hard. Kaman are going to put in unduplicated power boost to hide some of the feed-back. Duplication will not be necessary because manual control is straightforward. In a normally fully powered machine, manual control after hydraulic failure can be extremely heavy work and it may even be impossible to hover. The larger Sikorsky types, of course, have dual systems with full safety and no manual reversion.

The Huskie has been very carefully laid out for rescue work in accordance with the lessons learned in Korea by the US Marines. It should be very good at its job, and is certainly easy and forgiving to fly. The penalties of once-per-rev vibration and heaviness are not too high a price to pay for the very good qualities of the machine for its specialized role.

My last type was the Alouette III, which differed basically from the others in having a fixed-shaft turbine and rotor rotation in the opposite sense to that employed by Bell, Hiller and Sikorsky. The machine I flew was the one that had made the impressive landings at 19,700ft in the Himalayas last November. The Alouette's three-blade rotor turns at a very fast 360 r.p.m. directly coupled to the governed engine, and power-demand controls fuel input. Power indication for the pilot is by an instrument sensing collective pitch and Sud had devised a very cunning method of judging the weight of the helicopter and the power margin remaining for manœuvre. The collective pitch corresponding to maximum usable engine power at sea level is 7.5° and this rises to something over 10° at maximum height. A white segment next to the pitch scale on the instrument accordingly shows the heights opposite the appropriate maximum collective pitch. While this forms a rough guide, actual density taken from altimeter and o.a.t. gauge can be set on a small rotary computer round the instrument rim against the pitch setting which the pilot finds necessary to hover. The pitch required and the density will, because of the constant-speeding rotor, define the weight of the helicopter. The pilot can therefore allow people to load the cabin indiscriminately and lift off every now and then to check his gross weight. In addition he can hover, assess the weight, and also read from the computer the pitch margin he has left for manœuvre. Brief pressure of one finger is required to rotate the computer ring and the collective pitch is stable enough for brief hands-off hovering. So the pilot can accurately predict his performance in a tricky location, regardless of fuel state or other factors. He can also predict his performance at a greater altitude by reference to the scales. Sud stressed that, during operations in high mountains, this is a most valuable adjunct, because clients are rarely able or willing to weigh their freight before loading.

The Artouste 3 turbine gives 880 h.p., but only 550 h.p. is used and this power can be retained up to 16,400ft. Blade stall limits flying at full gross weight to heights below 13,800ft. In sea-level operation the r.p.m. remain remarkably constant, even during rough applications of full collective pitch at the hover and during really steep turns at top speed. I was flying with Sud pilot D. Prost, who really threw the Alouette around demonstrating its remarkable agility. I flew with a great deal more circumspection, but I liked the machine better than any of the others. Both cyclic and collective controls were fully powered, but there was an almost ideal combination of response and lightness with slight break-out force. I was very much on guard against applying wrong rudder, in view of the opposite rotation of the rotor, but when I brought the Alouette to the hover I really could not tell in which direction I had to apply rudder, even though I sat and thought about it. Pedal movement was very small and force imperceptible. During the cruise at about 150km/hr (93 m.p.h.) I needed a good deep push of right foot to keep straight, but in the hover the pedals were virtually centred.

Visibility through the wide, near-bubble nose was excellent. I had the impression that fore-and-aft attitude changes with changes in speed were fairly high. Because the machine was barely furnished, noise level was high and composed quite distinctly of turbine scream, rotor roar and airstream noise. Normal cruising speed was stated to be 190 to 200km/hr (118 to 124 m.p.h.), which is pretty fast. At such speeds, the Alouette was not especially noisier and certainly performed remarkably well, even in high-g manœuvres. Noise would be a problem for people working near Alouettes and I notice that the British Army and other operators use ear protectors. Otherwise the Alouette is stimulating to fly and is as much like a fighter as the Huskie is like a bomber. Incidentally, I know of no other helicopter, even in the constant-speeding brigade, which actually has no twist-grip on the collective lever. The Alouette has a rather smooth, shaped hand-grip.

The closing incident in this helicopter trilogy was Prost's return to base in the fringe of a corking rain storm while the Hunter Two-Seater was demonstrating and the tower had forbidden other aircraft to fly. He just sneaked in over the hangars, whirled round in a steep turn and put down right amongst the airliners. Quickly he taxied through a narrow gap and stopped in the hangar mouth. We were pushed into the back of the hangar before we had got out of the cabin. Those Sud pilots know their aircraft and their airfield—and the controllers—like the backs of their hands.

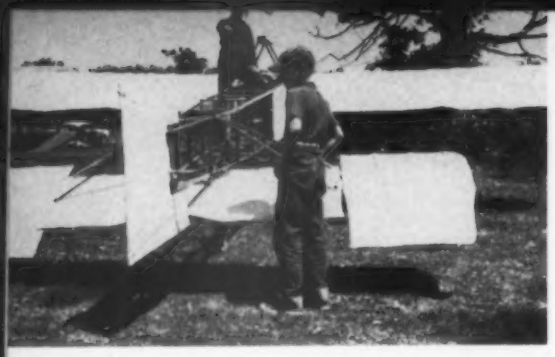
The Alouette III prototype flown by the author seen, left, up in the Himalayas and, right, flying more normally over France

DATA

Agusta Bell 204B (D.H. Gnome giving 1,000 h.p.): Rotor diameter, 44ft; empty weight, 4,280lb; maximum gross weight, 8,500lb; maximum speed, 147 m.p.h.; hovering ceiling in ground effect, 9,200ft; range, 250 miles.

Kaman H-43B Huskie (Lycoming T53L1 giving 850 h.p., limited to 725 h.p.): Rotor diameter, 47ft; empty weight, 4,500lb; gross weight, 9,150lb; cruising speed, 92 m.p.h.; maximum speed, 129 m.p.h.; service ceiling, 25,700ft; range, 210 miles.

Sud Alouette III (Turboméca Artouste 3B giving 880 h.p., limited to 550 h.p.): Rotor diameter, 36ft; empty weight, 2,300lb; gross weight, 4,190lb; cruising speed, 118 m.p.h.; hovering ceiling out of ground effect, 13,100ft; range, 345 miles.



AT THE OLD RHINEBECK AIRFIELD, New York, Cole Palen Jr is creating an elysian field for old aeroplanes. He caught the vintage bug in 1951 and is now one of the 5,000 members of the Antique Aeroplane Association. He holds a pilot's and a ground engineer's licence, and spends his summers farming and his winters rebuilding aircraft for other enthusiasts. He has recently renovated seven aircraft of the 1909-1918 period and made them airworthy. Five of these are seen in the largest picture. They are (front row) a Blériot monoplane, a 1918 Spad S.13, a Nieuport 28; rear row, a Sopwith Snipe and a Fokker D.VII. The Spad is the subject of the fascinating air-to-air shot. Immediately above a young visitor is being shown the Blériot. Below, in the first picture, Mr Palen is pointing out dummy machine guns on the Nieuport 28. The second picture below shows him at work on the Mercedes engine of the D.VII. In the last picture (extreme right) he is starting up the Gnome engine of the Nieuport.

PUTTING TH CL

TH CLOCK BACK AT RHINEBECK

Utility version of the Fletcher FU-24 is designed for general "workhorse" duties with good STOL performance. It has a gross weight of 3,500lb, can carry six persons, and is powered by a 260 h.p. Continental engine with fuel injection. The European distributors, Over-Seas Equipment Co, 48 Albemarle Street, London W1, are hoping to appoint a British agent soon and to demonstrate the type at the international light-aircraft exhibition at Luton during August 29-September 2

Sport and Business

EVERY PRIVATE AND BUSINESS AIRCRAFT OWNER in Britain has been invited to attend the annual pilots' rally at Elstree Aerodrome on Sunday next, June 18. The London School of Flying, operator of Elstree Flying Club and Elstree Air Centre, reports that the main purpose will be for people interested in light aviation to meet, talk shop and mix among plenty of aeroplanes. Several manufacturers will be represented, and there will be a short flying display beginning at 3 p.m. The meeting is not open to the general public this year—except to purchasers of pleasure-flight tickets at 15s.

Elstree's breakfast patrol on Sunday, May 28, was successful, with only two aircraft—Magister G-APAS from Biggin Hill and Turbulent G-APTZ from Redhill—penetrating the local defences. A pint tankard for a sealed landing time went to James Baring, pilot of a Turbulent.

SECOND LIGHT AIRCRAFT to be produced by Malmö Flygindustri is the MFI-10 Vipan (Lapwing), a high-wing four-seater designed by Ernst Wohlberg, a former Focke-Wulf designer and test pilot. Design features include aluminium-alloy sandwich construction for fuselage, wings and control surfaces, and a fixed landing gear of glass-fibre reinforced plastics. The aircraft is reported to have been developed in close collaboration with the Swedish military authorities and with Saab. It is primarily intended for reconnaissance, aerial photography, ambulance work, light transport, towing and flight training, and is also said to be suitable for use as a general-purpose aircraft in industry and for the transport of work crews to remote locations. Maximum speed of the Vipan is quoted as 150 m.p.h. The prototype machine was publicly shown for the first time recently.

LANCASHIRE AERO CLUB have appointed Charles Rollo as chief flying instructor, and are to operate two Piper Colts for training, following the success of the Tri-Pacer which they already have. The flying and social sides of the club's operations are to be separated.

CHRISTCHURCH AERO CLUB is now operating for instrument-rating training and practice and advanced multi-engine training the fleet of Airspeed Oxford aircraft previously belonging to the College of Air Training. Flying rate for the type is £16 per hour, with special contract rates for 20 or more hours.

INTERNATIONAL RALLY of the Popular Flying Association will be held this year at the College of Aeronautics, Cranfield, during September 8-10. PFA rally executive Neil Harrison reports: "Believing this event to be the only truly international rally for sporting pilots on the British calendar, special efforts are being made to attract Continental visitors, and in particular those flying the many interesting one-off designs." Flying and technical competitions will be included in the programme, and further details are obtainable from the Association at Londonderry House, 19 Park Lane, London W1.

The brand new Scintex ML.145 Rubis, which made its first flight as the Paris Salon began and appeared at Le Bourget with less than three hours' flight time. Claimed to be the fastest French four-seat executive aircraft, it has a 180 h.p. Lycoming engine, sliding canopy, retractable mainwheels and rearward-extending flaps

SOUTH AFRICA'S first President, S. A. Swart, is to donate a cup to the Aero Club of South Africa to replace the Governor-General's Cup, the last race for which was held on May 26-27 prior to South Africa becoming a republic. The Governor-General's Cup was presented by Sir Patrick Duncan in 1937. The race was to have been an annual event, but has in fact been held on only seven occasions —in 1937, 1938, 1939, 1954, 1957, 1959 and 1961. This year's race was won by a Pretoria pilot, A. P. Nieman, flying a Fairchild 24.

WORK HAS BEGUN on the first production model of the FBA-2A utility aircraft designed by Found Bros Aviation of Malton, Ontario. The prototype of the STOL machine has undergone tests in floatplane form in Toronto Harbour, and is now reverting to wheels for continued flight testing. The company reports that several orders have been received for the aircraft, although Department of Transport certification of the type is not expected until late autumn.

THE PLANNED PRODUCTION RATE of the Morane-Saulnier Rallye is to be doubled from 30 to 60 aircraft per month. The rate of 30 per month should be reached in July, and 60 per month by March 1962. First flights of the third prototype, the 145 h.p. MS.885, began during April and this machine is being shipped as a demonstrator to the USA. The United Kingdom distributors for the type, London Aeroplane Club, Panshanger, expect to receive their first Rallye late this month. This will be a 100 h.p. MS.880 Rallye-Club which will sell in this country at £2,450.

Mr Rex Smith (left), a director of Oxford Aviation Co Ltd, takes delivery of the company's new 1961 Piper Apache G from veteran ferry pilot Max Conrad. This was Conrad's 81st transatlantic crossing in a light aircraft. The Apache is joining Oxford's fleet for executive travel work

ORGANIZED BY the Derbyshire and Lancashire Gliding Club, the Northern Gliding Contest will take place at the club's Camphill, Great Hucklow site, beginning on July 30 and continuing until August Bank Holiday Monday, August 7.

D.H. DOVE G-AOFI, operated by the Pressed Steel Company, has recently been equipped with a comprehensive radio installation by A. J. Whittemore (Aeradio) Ltd. of Biggin Hill. The equipment comprises a Collins transmitter type 17L7A, receiver type 51X2B, VHF No 2 transmitter-receiver 618F-1, VOR receiver 51X3 with indicator 331H, and Marconi ADF type AD7092D. The removal of the radio equipment previously installed resulted in a weight saving of 250lb and the aircraft payload was increased to 1,074lb.

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Photo: "Flight" *Aero Show 1911*

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FIFTY YEARS OF FINISHES

CELLON LTD CELEBRATE THEIR GOLDEN JUBILEE

Top, the main Cellon works at Richmond Road, Kingston-upon-Thames. Left, the World War I factory at Richmond. Right, A. J. A. Wallace Barr, the company's founder (in sports jacket) with C. F. Cody, who used Cellon dope on the biplane with which he won the 1912 Military Trials

ONE of the many problems of the constructors of the earliest aeroplanes was to find a satisfactory method of keeping fabric lifting surfaces sufficiently taut for reasonably aerodynamic efficiency. In this, as in many branches of the aeronautical art at that time, the French were ahead of us.

A little over 50 years ago, in the spring of 1911, A. J. A. Wallace Barr was experimenting with cellulose acetate solutions for the purpose of manufacturing fabric dope. He worked practically single-handed in a small shed at Clapham, in South-West London, but he soon reached a stage when he could offer a satisfactory product to aeroplane-builders. Quite near by, under the railway arches at Battersea, the Short brothers were building their early aircraft, and they became his first customers. Wallace Barr had meanwhile become interested in a company which had acquired patent rights for cellulose-acetate solutions developed on the Continent, and soon afterwards a small company was formed of which he was both secretary and chief salesman.

That was, in effect, the birth of Cellon Ltd, who this month are accordingly celebrating the fiftieth birthday of the product which first made their name famous, though in fact it was to be another two years before the company was founded by Mr Barr under its present name.

Soon after the Short brothers began to use Cellon other pioneer constructors followed suit, among them the British and Colonial Aeroplane Co (now Bristol), A. V. Roe, S. F. Cody, T. O. M. Sopwith and Robert Blackburn.

In 1913 Wallace Barr received his first Government order for aeroplane dope, and it was in the latter part of that year that Cellon Ltd was formed, arrangements for large-scale production of dope being made with Thomas Tyrer & Co, a chemical firm in the East End of London. But there was still no British source of supply of the basic material, cellulose acetate, and Wallace Barr had to obtain supplies from France; after the outbreak of the 1914-18 war he made many trips across the Channel for this purpose, flying in RFC aircraft. Later the problem was to be simplified by the development of cellulose-nitrate dope, though for some time its use was confined to second-line aircraft.

In a war in which practically every aeroplane was fabric-covered, the Government's demand for dope was insatiable. Cellon Ltd acquired a factory at Richmond, Surrey, very small by comparison with what was to come later, yet capable of producing the as yet uncomplicated product in large quantities. At this period the company operated under the title of Cellon (Richmond) Ltd.

With the end of the Great War the need for aircraft dope slumped practically to zero. Although the word "diversification" was probably then unknown in its present popular context, the company had laid plans for just such a policy; they developed successful industrial and decorative finishes, gradually making increasing use of raw materials widely different from the old-established celluloses. Nevertheless, the aircraft side of their business was not neglected; and, as fabric-covering began to give place to plywood and metal, Cellon developed and manufactured finishes which would give good results on such surfaces. The slowly growing commercial-aircraft market was well catered for, and in the military field came the first demands for high-speed finishes; here, for example, Cellon were called upon to meet the exacting requirements of the Schneider Trophy Supermarine S.6Bs in the matter of high airspeeds and resistance to salt water.

By 1927 the demand for new industrial and aircraft finishes had outstripped the capacity of the Richmond works, so a five-acre site was purchased on the northern outskirts of Kingston-upon-Thames. Here a factory was built (with a frontage that remains aesthetically pleasing even by today's standards) and went into production early in 1929.

In 1936 Cellon Ltd became a public company; and at about this time, with the horizon already darkening for war again, new production shops were added to the works and the office block was almost doubled in size.

Between 1939 and 1945 Cellon's resources were entirely devoted to the war effort. Under the direction of the Ministry of Aircraft Production over 80 per cent of the output of finishes went to the major aircraft constructors; the remainder was destined for armoured fighting vehicles, for motor torpedo boats, for the camouflaging of buildings and for many other defensive and protective purposes. Cellon cellulose dopes and synthetic finishes were used on such famous aircraft as the Hurricane, Spitfire, Blenheim, Wellington, Mosquito and Lancaster. For the first time, the com-

One of several recent extensions to the Kingston works is the paint application laboratory. This is one of its twelve well-equipped rooms

FIFTY YEARS OF FINISHES...

"Flight" photograph

Left, a painting of No 111 Squadron's Hunters was presented by Mr Aubrey Barr, managing director, to Sqn Ldr (now Wg. Cdr) R. Topp, CO at the time of the squadron's famous displays. Also in the group are Roy Nockolds, the artist, and (wearing RFC tie) Wg Cdr J. C. Cantrill (director, and sales manager aircraft finishes division). Right, Mr R. J. Ledwith, technical director

pany produced over a million gallons of finishes in a single year. Mr W. J. Shilcock (who retired from the managing directorship in December 1959) organized the "Sobac" scheme under which paint manufacturers joined a pool for the supply of aircraft finishes manufactured by standard formulæ. Operated with Government approval, the scheme was designed to maintain uninterrupted supplies in the event of one or more factories being temporarily knocked out by the enemy.

Though the Cellon works at Kingston suffered no air-raid damage, the company sustained a grievous loss when, in February 1944, it lost its founder and managing director, Mr Wallace Barr and his wife being killed by a bomb that hit their home.

After the war, with the company now under the joint managing directorship of Mr Shilcock and Mr H. Lazell, the pattern of the previous post-war period was repeated, the company being faced simultaneously with shortages of raw materials and the need to find new outlets for its expanded production capacity.

Once again the accent was on research and development. It is Cellon's claim that they were the first paint firm in this country to produce etch primers and that they were among the first to develop chemical-resistant finishes based on epoxide resins and water-thinned p.v.a. emulsions. But many of their new products were for industrial purposes and are therefore outside the scope of this article. In the aircraft field the company was soon busy again, meeting the demands of manufacturers introducing new civil types; nor did military orders fall away to the extent they had done after World War I, and the rapid development of the gas turbine meant that there were calls for still more efficient high-speed finishes. A high-speed finish is one that can be polished to a high gloss, thereby reducing drag; but it must also be resistant to the abrasive effects of rain and hail, which are extremely severe at high speeds. In latter years, too, the increasing use of ester lubricants has introduced yet another problem for the paint technologist, for they have a destructive effect on finishes.

As soon as one such technical hurdle is surmounted another presents itself, so fast is the rate of aeronautical progress; and the next looks like being the production of finishes to withstand the kinetic heating effects associated with high-supersonic speeds. The Cellon technologists, we suspect, are already tackling this one with their customary confidence.

Reverting for a moment to civil aircraft, the company has in recent years been devoting a great deal of attention to interior finishes, and here their experience in the industrial and domestic-decoration fields has been valuable—though the materials used must, of course, be modified where necessary to meet aircraft specifications, particularly in respect of fire-resistance.

A study of the current catalogue of Cellon aircraft finishes is an instructive if (for the non-specialist) slightly intimidating exercise. It lists typical paint schemes, almost every material used having its appropriate DTD specification number. The index of materials alone runs to 40 items for military aircraft and 30 for civil, plus 42 under the heading "miscellaneous." The introductory note to the pages for one particular set of schemes offers a succinct summary of typical modern requirements and the materials which Cellon offer to meet them:—

"Modern finishing schemes for the internal and external surfaces of military and civil aircraft must supply protection against moisture condensation, heat, pyrolised ester lubricants, hydraulic fluids, etc, and the wide variety of chemical and physical attack experienced on airframe surfaces. The following schemes have been developed to suit these conditions and are subject to rigorous inspection schedules, which include corrosion, water condensation and contaminant-resistance tests, as detailed in Defence Specification 1053 and DTD Specifications. These cold catalysed (C.C.) finishes are based on the latest developments in epoxide resins, and either a polyamide or amine adduct curing agent is used according to performance requirements. High gloss can be obtained without the use of a filler, thereby providing lower film weights and shorter overall production times than with orthodox finishing schemes. Fillers, however, are available when surface irregularities necessitate their use. Pre-treatment primer and water-resistant etch primers (P.W. type) are approved both as universal primers conforming to current DTD specifications and for use with C.C. finishes as recommended below."

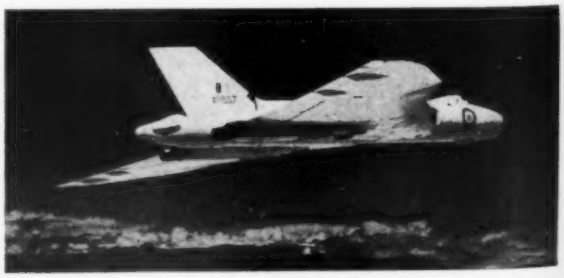
But to return, finally, to the recent history of the company. In the past five years new sales and service branches have been opened in a number of provincial centres and extensions have been made at the Kingston factory, including a new thinners shop with automatic filling equipment, a new colour matching shop and a second floor to the chemical laboratory.

In February 1960 a completely new paint application laboratory was opened, in which new finishing processes are tested, i.e., the various finishes are tested in conjunction with the kind of equipment—spray, dipping, roller-coating, electrostatic, roller-conveyor stoving and many others—which the customer uses in his own works. Though here again the accent is mainly on mass-production and other industrial processes, the laboratory is equipped to deal with many of the paint-application problems likely to arise in the airframe, engine, missiles and component industries.

Today Cellon Ltd is a member of the Courtauld group of companies. This new association began in August 1958, so now the firm can call on the technical and financial resources of this vast organization; but its own identity and "personality" has not been submerged—the aircraft-industry visitor to the Kingston works can still quickly sense that enthusiasm, and understanding of his needs, that was born 50 years ago in the little business in Battersea.

Left, RAF technicians watch demonstrations of painting aircraft components during a tour of the works

Right and below: among modern aircraft for which Cellon supply finishes are the Avro Vulcan B.2, Blackburn Buccaneer and Avro 748



BOAC v. Cunard Eagle

North Atlantic Case

AIR TRANSPORT LICENSING BOARD HEARING: THE CONCLUDING PHASES

THIS is our fourth and final review of the most important case yet heard by the Air Transport Licensing Board—Cunard Eagle's application for a licence to operate across the North Atlantic. Another note on the hearing appears on page 843.

ON the subject of US traffic rights, Mr Basil Smallpeice, BOAC's managing director, was allowed by the chairman, after an objection by Mr Ashton Hill, to quote the opinion expressed in a speech by Mr Boyd, chairman of the CAB, that the principles embodied in the 1947 Bermuda agreement "are subject to serious criticism today" (see *Flight* June 1, page 773).

In reply to a question from Mr Fisher about possible benefits to British aviation in general through the Cunard sales organization on the north American continent, Mr Smallpeice said that BOAC had for some time been trying to reach agreement with the Cunard Steam-Ship Co for mutual exchange of booking facilities. The 1960 agreement between IATA and the Atlantic Shipping Conference provided for this.

Mr Smallpeice was of the opinion that Cunard Eagle's operation of a daily service to New York throughout the year would undoubtedly lead to diversion of traffic from the lightly loaded winter flights of BOAC. After careful consideration of the Cunard Eagle proposals, he was of the opinion that all the traffic carried by Cunard Eagle would be diverted from BOAC. In terms of money, this would mean the diversion of £5m worth of traffic per annum on routes to the United States and £2½m per annum on routes to Canada.

With reference to BOAC's financial commitments, Mr Smallpeice said that by 1963 the corporation would be employing on these routes 12 Boeing 707s and nine long-range Britannias, representing aircraft capital of £25m. By that date 39 per cent of BOAC's output would be on these routes, representing capital of £39m which would have to earn £2m solely to repay Government interest.

Mr Smallpeice recapitulated details of aircraft for which orders had been placed, and said that delivery of Vickers VC10s should begin in December 1963; the modified Super VC10s would be delivered during 1964, 1965 and 1966. By the time all the aircraft ordered had been delivered, 33 per cent of BOAC's total output would be on the routes for which Cunard Eagle were seeking licences, and a further 19 per cent on allied routes, and BOAC's total capital at that time would be £250m.

The proposed Cunard Eagle services would provide 147,000 seats per annum, and of these 98,000 would be on the New York route. This would represent one-quarter of the capacity which BOAC would be providing after 24 years' development work. The diversion of traffic would necessitate reduction of the BOAC capacity to ensure reasonable load factors, resulting in fleet redundancy.

The TCA Agreement

With reference to the "commercial agreement already entered into" with TCA, Mr Smallpeice said that at least 50 per cent of any traffic carried by Cunard Eagle between the UK and Canada would be diverted from BOAC, as TCA and BOAC were the only carriers at present on the route. It was likely that TCA might seek a revision of the pooling agreement, should a second UK carrier be licensed, to compensate them for traffic diverted from their services by Cunard Eagle.

Mr Smallpeice continued his evidence with figures to demonstrate that the capacity which Cunard Eagle proposed to offer would, during the year 1963-64, represent 25 per cent of the British share of the gross passenger revenue potential on the USA east coast routes, and 29 per cent on the Canadian routes. They would also represent 10.7 per cent of the total gross passenger revenue potential on the New York route and 14 per cent on the route to Canada. He suggested that the passenger capacity of two Boeing 707s in one year over the Atlantic was approximately equal to that of two "Queen" liners.

He thought that the designation of Cunard Eagle as an operator on the Canadian routes would probably lead to the designation by the Canadian Government of Canadian Pacific Airlines. This would mean that BOAC would have to share with three other carriers a market which hardly justified an economic frequency of operation even by only two.

On the routes to the USA the result might be the designation by the US of Seaboard, who were already seeking rights. At present there were only two US carriers serving the whole of Europe as well as the UK. Of the many countries which had rights into the US, none had designated more than one carrier. The licensing of Cunard Eagle might well upset negotiations with the US over traffic rights for American carriers elsewhere, with unfavourable results to BOAC traffic in various parts of the world.

BOAC also objected to Cunard Eagle's seeking transit rights to European countries. Although BOAC already had transit rights for the routes New York - London - Paris and New York - London - Frankfurt, they were unable to take advantage of them because of the conditions which the French and German Governments insist on imposing.

At this point BOAC asked leave to introduce a confidential document showing the relative profitability of the various routes operated by the corporation. Copies were given to the Board and to the applicant, but it was stressed that the figures were confidential and not for publication. This, of course, while not preventing the Board giving what consideration it might think was due to the document, would effectively prevent Mr Ashton Hill cross-examining Mr Smallpeice on its contents at a public hearing.

Mr Ashton Hill began his cross-examination of Mr Smallpeice by querying the analogy between the capacities of Boeing 707s and "Queen" liners on the north Atlantic. Mr Smallpeice explained that this was based on an assumption of five round trips per aircraft per week and Mr Ashton Hill conceded that two Boeings might be considered to equal one-and-a-half "Queens."

Cunard Eagle's advocate then referred to Mr Smallpeice's statement that this was not a case in which BOAC was making an automatic objection. Would BOAC automatically object to an application for a route on which they were operating? Mr Smallpeice replied that this would not necessarily happen, but they would probably object so as to have the opportunity of satisfying themselves that the applicant had some contribution to make to the route.

There was some difference of opinion as to whether an independent operator could have applied for a licence to operate the South American routes during the period 1954-60. Mr Ashton Hill suggested that these routes had remained protected to BOAC whereas Mr Smallpeice held that they could have been applied for as "lapsed routes"; BOAC had, in fact, sought in vain for an independent British operator to fly the routes on behalf of the corporation.

What is "Profit"?

Mr Ashton Hill then turned to the question of profitability of routes and the definition of "profit." He suggested that a route on which the excess of operating revenue over expenditure did not suffice to repay to the British Government the interest on the invested capital which the route represented could not truly be called profitable. Mr Smallpeice insisted on the difference between payment to a shareholder and profit to an owner. In the case of BOAC the British Government was in the position of an owner. The Atlantic eastern seaboard routes could therefore now be fairly considered to be profitable.

He asked whether there might not be delays in the delivery of VC10 and Super VC10 aircraft to BOAC, as there had been delays in the delivery of other aircraft in the past? If there should be such delays might it not be to the advantage of British civil aviation to have a second carrier operating on these routes to ensure against the loss of part of the British share of the traffic as had happened at the time of the withdrawal of the Comet 1s? To this Mr Smallpeice replied that delivery delays entailed only a temporary setback, not comparable to the complete removal of a type already operating.

Mr Ashton Hill turned to BOAC's objection on the grounds of financial resources of Cunard Eagle Airways, and suggested that there was in fact no paradox in the Cunard Steam-Ship Co backing Cunard Eagle's application while borrowing from public funds to build Q.3, as Cunard Eagle's application must be supported from the company's own resources. Mr Smallpeice replied that there certainly seemed to be a paradox, as the Cunard borrowings might go into the general kitty.

Continuing with questions on this subject, the chairman pointed out that his cross-examination seemed to be unconnected with Mr Smallpeice's evidence, and was therefore out of order. Mr Ashton Hill could raise the subject again in his final address if he wished to do so.

The next session opened with the lodging of documents by both BOAC and Cunard Eagle. The corporation put in an amended version of the document which had been numbered B30, presumably that in which the profitability of various routes was compared, and which was not for publication. Cunard Eagle submitted a copy of the foreign carrier's permit issued by the CAB to Cunard Eagle (Bahamas) Ltd.

(*continued overleaf*

BOAC v. Cunard Eagle North Atlantic Case . . .

Mr Ashton Hill asked whether BOAC intended to provide copies of the purchasing contract for the VC10 and Super VC10 since this had been mentioned by them as a "financial commitment reasonably entered into." Mr Smallpeice explained that the contract contained a clause specifically requiring that it be treated as a confidential document, and Mr Ashton Hill did not press the point, although Mr Smallpeice was prepared to provide copies for the Board and for the applicant.

Mr Smallpeice was asked about BOAC 's borrowing powers, and confirmed that £150m of the permitted £180m had already been committed, and that further borrowing powers would in time be necessary. He pointed out that the purchase contracts had the full approval of the Government.

In answer to further questions he said that the load factor of 60 per cent, which had been used as the basis for assessing future aircraft requirements, had been achieved and sometimes exceeded in the past; at this factor the routes would show a profit. He could not give an accurate figure for the number of charter flights on the North Atlantic planned for 1961, but agreed that it might be as many as 600. The only restriction on the number was aircraft availability.

Mr Ashton Hill then referred briefly to the speech in which Chairman Boyd, of the CAB, had suggested that the bilateral agreement might need revising, and it was established that this speech had been delivered on March 23.

Mr Ashton Hill also referred to the association which had existed between Imperial Airways and Cunard Eagle when the Cunard Company acted as agents for Imperial Airways. This association had been terminated by BOAC.

He then again turned his attention to the estimates of future traffic which had been submitted by the corporation and asked whether these had formed the basis of the aircraft orders placed by them. Mr Smallpeice said this was not strictly so, as the aircraft procurement contracts had been based on figures prepared in 1956-57, which had been revised from time to time since. Asked for details of these revisions, he gave dates of eight ten-year estimates prepared from 1956 up to April this year.

BOAC Figures Challenged

Mr Ashton Hill continued to probe the BOAC figures, with particular reference to those for the operating year 1960-61, which (he argued) were not borne out by the actual traffic figures, now available. There followed a rather lengthy series of questions and answers about preparation of estimates, interpretation of statistics and adjustments for abnormal factors in which Mr Ashton Hill's purpose was to demonstrate that BOAC had taken every possible factor into account in preparing their estimates, but that even the best-prepared estimates could not always be right.

Asked whether BOAC, having calculated the total traffic, and the British share of that traffic, were going to carry the lot, Mr Smallpeice said that they had made provision to carry the lot; whether they do must depend on the decision of the Board. Questioned as to what was meant by "material diversion" and whether this could not be expressed in numbers of passengers, Mr. Smallpeice would only say that a diversion producing a significant effect on the profit-and-loss account would be material.

An examination of BOAC estimates that the operation of he proposed Cunard Eagle services to America and Canada would divert £5m and £2½m from the corporation was equally unrewarding. Mr Smallpeice insisted that all the traffic carried by Cunard Eagle on these routes would, because of the bilateral agreement in the one case and the pooling agreement with TCA in the other, be taken away from BOAC.

This stalemate ended Mr Ashton Hill's cross-examination of Mr Smallpeice, but Mr Fisher briefly re-examined to clarify one or two points which had arisen in cross-examination.

Mr Smallpeice then answered various questions from the Board. He explained what allowance had been made in the traffic estimates for fare reductions which were likely to be made, how seasonal traffic peaks affected aircraft utilization, and the extent to which aircraft purchasing commitments were connected with the North Atlantic routes. He did not think that the introduction of a new carrier would lead to an increase in the total traffic, as there were already 18 carriers operating, 11 of them through the United Kingdom. He confirmed that he thought that any consistent tendency for the proportion of the traffic to the East Coast of the United States carried by British operators to exceed 43 per cent might lead to a demand for the revision of the bilateral agreement.

After the luncheon adjournment Mr Fisher made his final address to the Board. He began by submitting that it was up to the applicant to establish a case for the granting of a licence; even if there were no objector, the Board could still refuse to grant a licence. Therefore, if any arguments advanced by the applicants—such as statistics submitted—failed to satisfy the Board, the application must fail. Furthermore, the application must be considered only in the light of evidence which had been presented; any part of the application on which no evidence had been offered must go by default. Cunard Eagle had made no case, and offered no argument, except for a service carrying passengers and supplementary cargo daily between London and New York, and three or four times a week between London and Montreal up to 1965.

Secondly, Mr Fisher submitted that the case must be decided on the evidence already offered, and Mr Ashton Hill could not, therefore, offer any new arguments in his final address; this must deal only with matter raised in evidence.

Further, the case must be decided in accordance with Section 2, subsection (2) of the Civil Aviation (Licensing) Act, 1960, and should not be influenced by extraneous documents, such as the American report introduced by Cunard Eagle on the first day of the hearing.

Comments in "Flight"

Mr Fisher referred to what be called "offensive comments on lawyers in general and on himself in particular" which had appeared in *Flight* but commented that he was indebted to that same publication for pointing out that the document in question weakened rather than supported the applicant's case.

BOAC's objection was founded, he continued, on paragraphs (d), (e), (f) and (g) of Section 2, subsection (2) of the Act of 1960. Under paragraph (g) they had submitted evidence of contracts entered into for the purchase of aircraft to meet the estimated future traffic on the routes, and their objection under paragraph (f) was based on estimates made to enable them to assess their future aircraft requirements, and to enable them to justify to the Government their request for funds for the purchase of equipment. These statistics had not been prepared for the purpose of helping them win their case. Cunard Eagle had produced estimates by extrapolating from figures for years which included major disturbing factors, such as the introduction of economy fares and of the new big jet aircraft.

Mr Fisher continued with further argument in justification of BOAC's figures, and asked that the Board should be guided by these rather than by those of Cunard Eagle. Unless the corporation's figures were wildly inaccurate, any traffic carried by Cunard Eagle must be diverted from BOAC, and that this diversion would be material was clear from an examination of Cunard Eagle's proposed services. The duplication which Cunard Eagle's services would represent would be wasteful, because BOAC had made provision for carrying the full British share of the traffic. This duplication might lead to the need for reducing the frequency of the corporation's services, with consequent aircraft redundancies.

Mr Fisher continued with the submission that the British share of the traffic must be expressed as a percentage of the total, for two reasons: (1) this basis of division of traffic was used in bilateral agreements; and (2) as traffic increased foreign airlines would increase their capacity, in the same way as would BOAC.

On the subject of Cunard Eagle's financial resources, Mr Fisher referred to the cross-examination of the applicant's witness on this point, and suggested that, on the evidence placed before it, the Board should not be satisfied that the resources were adequate.

Cunard Eagle's case rested, said Mr Fisher, on the argument that there would be no material diversion of traffic, and this they had demonstrably failed to establish.

Mr Ashton Hill began his final address by rejecting Mr Fisher's initial submission. The Board was not a court of law. The Act provided that the Board must satisfy itself on various points, but these need not be demonstrated by evidence at the hearing. The application should be considered in the terms in which it was submitted; Cunard Eagle wished to have the right to operate all the routes set out in their application, as and when operation might be justified by traffic.

Mr Ashton Hill submitted that the financial resources of Cunard were sound and their trading history better than that of BOAC. The financing of the construction of the Cunarder Q3 was irrelevant, as this was under discussion before the formation of Cunard Eagle.

He again sought to discredit the corporation's estimates of traffic potential on the grounds that the actual figures for 1960-61 differed widely from the forecasts. Nor, said Mr Ashton Hill, were Cunard Eagle prepared to accept the principle that British carriers would always carry only 43 per cent of the traffic on the east coast routes.

He argued that BOAC's purchasing commitments were not valid grounds for refusing this licence and, with reference to the pooling agreement between BOAC and TCA, he suggested that recent changes in Canada made it probable that CPA would be licensed to operate over the Atlantic.

He repeated his argument that a second British carrier would safeguard the British share of the traffic should BOAC be handicapped by delays in the delivery of their new aircraft. Cunard Eagle were ideally suited by their experience on the route for the role of second British operator, and this route, if any, justified dual participation.

Straight and Level

AIRLINES have no shame. You would have thought that they would maintain a decorous reticence on the subject of pooling agreements, so commercially unsavoury is the whole principle of the thing.

Not so Air-India. I have just seen an advertisement for the airline which says: "We've got a real cool pool on the Bombay - London - New York, Bombay - Tokyo and Bombay - Sydney routes." With BOAC and Qantas, they say, "we are happy in our blue heaven! We get along swimmingly! Care to join us?"

If I were British United Airways my answer would be No Thanks.

● *In Mozambique*
The beer is hardly weak
But in Peru
They have an even stronger brew.

These and other intimate details of 101 different countries can be gathered from BOAC *Travellers' Digest*.

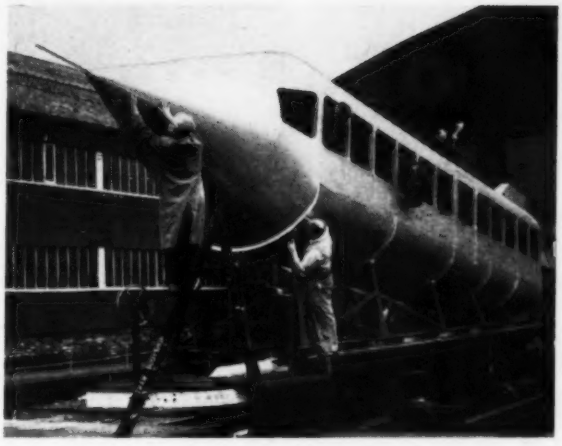
All kinds of people go by air these days. Most because it's the quickest and easiest way to get from A to B, but some because they enjoy the trip itself as well as what they find at the end.

This book anticipates the kind of questions all these people may ask about strange lands. Is it safe to drink the tap water in Mexico City? (Yes.) Can I find a good hairdresser in Japan? (Yes.) What's the weather like in Greece in February? (It may snow.)

The specialist cannot expect to find in this book a thesis on his pet subject, but he will appreciate some basic enlightenment on a country's history, its constitution, the vegetation, the native birds and animals, and the customs of the people. He can also find out where to shop and where to enjoy himself.

Armed with this nicely produced little book the inexperienced traveller may sally forth with confidence. Even the most blasé globe-trotter may find that he's been missing something.

The other week our printers, in a rare moment of fallibility, sent us a rough galley proof which included the passage "the entire tram involved in Project Mercury." Their proof-readers caught the error—"tram" should have read "team." We had a good editorial laugh. Then, believe it or not, this picture came in—of a rocket ship built on a 1926 Blackpool tram chassis which will be "put into an orbit around the forthcoming 1961 Illuminations"



● I have just been reading a new book, *The Millionaire Mentality*, by Michael Pearson.* Freddie Laker, now British United Airways executive director, has his place here; but so, I think, should a nameless benefactor. It seems that, having tried his hand at various enterprises after the war, Mr Laker went in for aircraft disposal on behalf of a Scot who had thought that he would lose heavily but did, in fact, recoup most of the capital he had invested. When the deals were completed the two men were having a drink in the "Silver Cross" in Whitehall. The Scot was grateful and asked Freddie if there was anything he could do for him. "The only thing I'm short of is money," he replied, "but then, everybody's short of money."

In reply to an inquiry as to what he would do if he *had* money, Laker laughed. "That's easy," he said. "BOAC have got a fleet of twelve planes they're putting on the market. I don't give a damn about the aircraft, but they're selling six hundred tons of spares at the same time and I'd give a lot to get my hands on those." Questioned what he would need to buy the lot he replied: "Thirty-eight thousand." The Scot took out his cheque book, rested it on the bar and wrote out a cheque for £38,000. Then came the airlift, and within a year the £38,000 was repaid and Freddie was in the air transport business. He is a big man now, but he never forgets that he was once one of the little men.

* Secker & Warburg, 16s.

Do you remember my "Life Goes On" series of aircraft doing a job after retirement? Here's another—and one which for sheer ingenuity beats the lot. The proprietor of this hotel in Alken, Belgium, has erected this Fairchild 71 in the attitude shown to attract the attention of passing motorists. It works

TEST YOUR ARITHMETIC
Baconundrum XXXVIII

If the Air Transport Licensing Board takes 18¾hr and six days to hear one applicant (Cunard Eagle) and one objector (BOAC) argue over a route about which there are no real doubts as to the existence of traffic, or Britain's right to have two carriers . . .

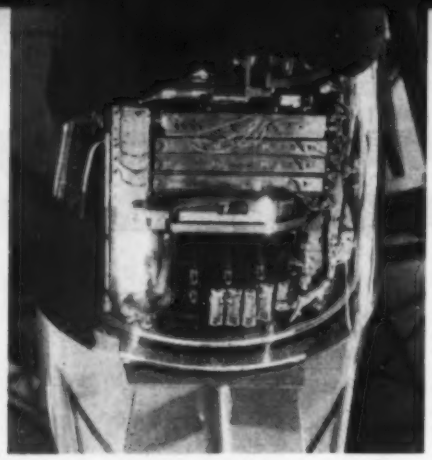
How many hours and days will it take to hear 69 applicants and 257 objectors argue about 30 routes from the UK to Europe, about which there are very real doubts on the score of traffic and BEA's pool agreements, and about Britain's right to designate two carriers?

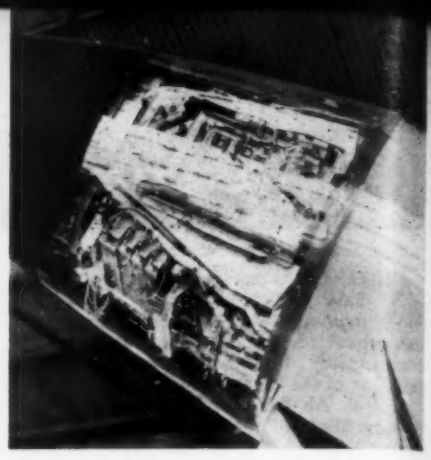
Answers should be addressed to Uncle Roger, "Flight," Stamford Street, London SE1, by not later than next Tuesday, June 20. The first correct answer to be opened will qualify for the first prize, which will be an abstract bronze sculpture of a yawn.

Supplementary question: If 257 objectors try to get into the Air Transport Licensing Board courtroom all at once, how many objections will there be to the objectors? Give your answer to the nearest objector.

● *"As a result, the nine blue Hunter aircraft gave a modified display ending in a flat pomp burst with smoke trails across the airfield . . ."*
—The Guardian

ROGER BACON





Three views of the C.S.F. Cyrano fire-control radar as exhibited at the Paris Salon. The left view, of the starboard side, shows the thyratron at the top. The klystron is masked. The centre picture shows the underside with some of the modules withdrawn and miniature coaxial cables in place. The port side contains the power packs and modulators. Each module has a separate test-socket and limited qualitative performance checks can be carried out before flight

FLIGHT SYSTEM SURVEY

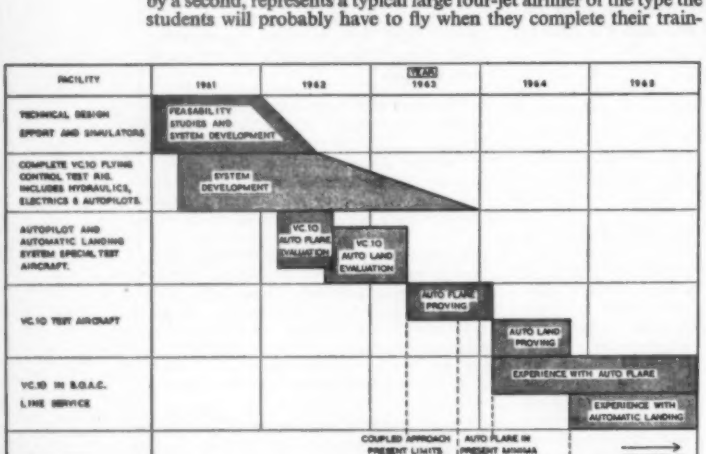
Sperry for the Boeing 727

THE flight control system for the Boeing 727 is being designed by the Aeronautical division of Sperry Rand at Phoenix, Arizona, under a $7m contract from Boeing. Called SP-50, the new autopilot will incorporate many features intended to increase reliability, including conservatively rated components and items capable of withstanding temperature variations much greater than those normally encountered in jet transports. Portions of the system will be specially grouped for easy maintenance, but Boeing have specified that electronics for pitch and roll axes shall be mounted separately. There will also be duplicated yaw-dampers. Sensory equipment includes a very sensitive air data computer, pitch, roll and yaw rate gyros of "unique, simplified design" and control surface-position sensers. The autopilot will operate the powered control servos.

New Flight Procedures Trainer

Now operating at the College of Air Training at Hamble is the first of a new type of simulator designed by the Air Trainers Link division of General Precision Systems Ltd of Aylesbury. The trainer is intended to reproduce the general appearance, layout and performance of a typically modern, multi-engined aircraft and the DC analogue computers are sufficiently flexible to allow simulation of characteristics typical of a wide range of aircraft. Characteristics can be changed by simple adjustments and the use of pre-calibrated plug-in units.

A navigation unit capable of tracing flights of about 700 miles and of simulating eight radio navigation beacons forms part of the simulator. The installation at Hamble, which will shortly be joined by a second, represents a typical large four-jet airliner of the type the students will probably have to fly when they complete their training. A full range of failures can be introduced from a console which can either be positioned next to the instructor's (co-pilot's) seat or detached and moved back to be operated by someone in the third seat. Engine noises, the sound of tyres on touch-down and rumble during taxying are also reproduced.



A diagram recently issued by British Aircraft Corporation showing the schedule of test phases leading to reduction of landing weather minima by use of automatic landing equipment in the VC10. The flight control equipment is made by Elliott Brothers

Coded Radar Transponders

THE Federal Aviation Agency is proposing to make coded radar transponders mandatory for aircraft operating in positive control areas in the US. At present there is only one such area which would be affected by the regulation, namely, the airspace between 24,000ft and 35,000ft covered by long-range radar from Chicago, Indianapolis and New London, Ohio.

The regulation would not apply to the three positive control transcontinental airways between 17,000ft and 22,000ft. Comments on the proposal are called for by July 4. Transponders are already required in positive control areas, but they need not be coded. Aircraft operating VFR or "VFR on top" in jet advisory areas would also have to obtain prior permission from the traffic control organization.

Going Transatlantic

AN agreement for the manufacture under licence by Packard Bell of the Solartron CD.1014 and CD.1016 double beam oscilloscopes has been concluded, and 200 sets are initially being delivered from Britain so that sales can begin immediately. Packard Bell intend to begin volume production in October with a view to selling 6,000 sets per year. The CD.1014 and CD.1016 are respectively portable and rack-mounted versions of this very successful equipment, which Packard Bell will market in North, Central and South America. Preliminary negotiations were carried out by Solartron Inc at Anaheim, California, and discussions were held on the spot by Mr John Bolton, managing director of the Solartron Electronic Group.

The company also announce that their CT436 portable double beam oscilloscope is being supplied to the British Services and has been designed to meet the rigorous K114E test specification. The equipment can operate from 45-400c/s a.c. mains or from 24/30V d.c. and weighs 28lb.

A Service order has recently been placed for digital computing and data handling equipment for the high-speed processing of digital radar information at RAE Aberporth. Polar co-ordinates transmitted over land-lines from two AN/FPS-16 radars are converted to cartesian co-ordinates and parallax corrections applied in relation to the location of other test equipment such as telemetry receivers and photographic trackers. A series of converters then feed plotting tables, high-precision serves or data transmission lines. Constituting the basis of this versatile equipment are six Solartron Minimal computers which have an extremely high rate of computation.

AIR COMMERCE

A "COMPASSIONATE" LICENCE

IS it right for an airline to accept bookings for an IT service before the Board has heard its application for such a service, in the hope that the Board will grant a "compassionate" licence to avoid disappointing holidaymakers who have booked? This question was raised at the recent hearing of Falcon's application for a Gatwick-Malaga-Tangier IT service in conjunction with Flightways, with BEA and Gibraltar Airways objecting that material diversion from their Gibraltar and Tangier services would result; this objection applied to Malaga also, since this was served by a connecting bus service from Gibraltar.

Flightways contended that it had not been possible to book on BEA, quoting a letter written at the end of March by BEA to Group and Personal Travel enquiring on behalf of the Peterborough Young Farmers' Association. BEA said that there were 1,445 seats available spread over the season, not counting those available in 33 extra flights planned for July and August. Flightways was unable to produce a copy of the letter of enquiry from Group and Personal Travel to BEA, and could not quote its exact contents. The Board did not seem too pleased that Falcon had on their own admission been accepting deposits against bookings, and were now pleading disappointment to holidaymakers if their application was denied.

The Board rejected the Tangier application, but granted a licence to fly to Malaga from July 2 to August 13 outward and until August 28 for home-bound flights. This decision was out of sympathy for passengers who had already booked with Flightways, but even so 540 of the 1,167 passengers booked with Flightways will go by BEA. Mr Peter Sinclair, managing director of Flightways, later made the surprising assertion at a press conference that "Cheap air holidays for Britons going abroad are very likely to become a thing of the past. The cost of them is going to increase by something like 50 per cent and, in some cases, even more." Mr Sinclair has asked Falcon to appeal to the Minister.

American salesmanship surpassed itself on June 8 when Boeing's Vertol 107 demonstrator was used to fly Mr Peter Thorneycroft, Minister of Aviation, to attend the Royal wedding at York. It was flown to Clifton airfield from the Westland heliport in London by BEA's chief helicopter pilot, Capt J. Cameron. The picture shows the wedding party before departure, with Mr Thorneycroft third from the left. Mr A. H. Milward, BEA chief executive (foreground), saw them off. The corporation is discussing with Sabena the joint operation of Boeing V-107s, perhaps in 1963, on services linking London, Brussels and Paris

PUBLIC MEETING 21

IT was British United Airways who took the initiative, two or three months ago, in arranging the *entente* with Cunard Eagle announced last week. Each side has done what is colloquially known as a carve-up of their route-pies in the sky.

To go back to the beginning, last January British United applied to the Air Transport Licensing Board for licences to operate from London Gatwick to no fewer than 31 destinations in Europe and the United Kingdom. Of these nine have now been withdrawn, including all those in the United Kingdom. The complete BUA list is now as follows, with the withdrawn destinations in bold type: Paris, Brussels, Amsterdam, Frankfurt, Düsseldorf, Munich, Cologne, Zürich, Basle, Tarbes, Nice, Naples, Milan, Rome, Genoa, Athens, Nicosia, Barcelona, Palma, Lisbon, Madeira, Dublin, **Biarritz, Palermo, Turin, Venice, Malaga, Manchester, Glasgow, Edinburgh** and **Belfast.**

Soon after BUA, Cunard Eagle submitted a broadly overlapping series of applications for Europe and United Kingdom routes to 34 destinations, mainly from London. Of these, Cunard Eagle have now withdrawn 15 European destinations, though none of their UK routes.

The Cunard Eagle list is as follows, with the withdrawn routes in bold type: Hamburg-Berlin, Copenhagen-Stockholm, Nice and/or Palermo and/or Malta, Turin, Milan, Venice, Dublin, Geneva, Liverpool-IoM-Belfast, Liverpool-IoM, Liverpool, Edinburgh, Glasgow, Birmingham, Manchester, **Paris, Brussels, Amsterdam, Dusseldorf** and/or **Munich, Basle** and/or **Zurich, Genoa, Rome** and/or **Athens** and/or **Istanbul, Nicosia, Barcelona** and/or **Palma, Dublin;** Manchester and/or Birmingham to: Nice, Dublin, London-Guernsey and/or Jersey.

Broadly speaking, British United Airways have thus left UK domestic services to Cunard Eagle, while that independent has left Europe as British United's dominant sphere while retaining its bid for a dozen points. The carve-up is not neatly geographical, and the two independents are still overlapping in their bids for services from London to Nice, Milan and Dublin. However, according to a joint statement, "the two companies have withdrawn their objections to all of each other's applications."

These applications will begin to be heard at Public Meeting No 21 of the Air Transport Licensing Board, which is due to begin at 2.30 p.m. on June 20 at Therese House. It will continue, to quote the Board, "on as many of the following dates as may prove necessary: June 21, 29 and 30; July 4, 5, 6, 11, 12, 18, 19, 25 and 26; August 1 and 2." If necessary, further dates will be arranged—though the Board warns that these may be as late as October because of its other commitments (among them, as recorded last week, a prodigious series of inclusive-tour applications). The Board also warns the public and the Press that accommodation may be limited, at any rate in the opening phases.

The applications to be heard at Public Meeting 21 fall into two groups: A, applications from British United, Cunard Eagle, BEA, Overseas, Tradair, Silver City and East Anglian for European routes; and B, applications from Cunard Eagle, Starways and Overseas for UK domestic routes. The Board has evidently had second thoughts about including British United's applications for routes to the Far East and Africa, for these are not now down to be heard at Meeting 21.

There are, in the European group A, 58 applications from the seven independents mentioned (there were 73 before the BUA-Cunard Eagle deal). Each application is objected to by never less than three and sometimes as many as six parties. Altogether in this European group A alone, the Board will hear not only 58 statements advocating applications, but more than 226 statements (compared with 330 before the BUA-Cunard Eagle deal) objecting to these applications. Of these 226 objections, the bulk come from the following: BEA, 50; BOAC, 39; East Anglian, 28; Tradair, 28; Cunard Eagle, 17; British United, 16; Silver City, 12; Skyways, 10; and others from Dan-Air, Overseas Aviation, Air Safaris, Starways and British Railways. The surprise here is the large number of the objections lodged by BOAC, who evidently now regard UK-Europe as very much their sphere of influence. It is thought likely that British Railways may withdraw some of its objections to certain independent applications, presaging perhaps a trend towards co-operation with, rather than antagonism to, air transport.

So far as the domestic applications are concerned (group B) there are 11 applications from Cunard Eagle, Starways and Overseas. To these there are 31 objections.

Thus Public Meeting No 21 is scheduled to hear a total of no fewer than 69 statements in support of applications, and 257 statements objecting to these applications. At least the prospect is not so daunting as it was before the two main independents carved up their pies, when it appeared that there were going to be 88 statements by applicants and 385 statements by objectors.

Nevertheless, it is anybody's guess how long Public Meeting No 21 will last. When it is all over, and the Board gives its decisions, there will inevitably be appeals. The process would then be repeated before an appeals-commissioner, though perhaps not at such length. When *that* is all over, the Minister can direct re-hearings, or just reject the appeal-commissioner's recommendations. It is the Minister who will always have the last word.

(*See leading article: page 817*)

De Kroonduif, KLM's associate in Dutch New Guinea, have taken delivery of a third Scottish Aviation Twin Pioneer. A Series 3 aircraft, it was flown to Biak on June 1. In the picture, left to right, are: H. G. Hart and N. J. Capper of Scottish Aviation; P. Rombouts, Civil Aviation Department, Netherlands New Guinea; and Capt Ryswyk, E. W. Dunlop, J. H. Crans, J. Van Den Bos and H. Luschen, all of De Kroonduif

AIR COMMERCE . . .

OVERSEAS VISITORS TO SALISBURY

THE Air Transport Licensing Board has heard British United's application for a licence, at the request of Central African Airways, for nine flights, one per month from July, 1961 to March, 1962, to carry members of the Overseas Visitors Club between Salisbury, Southern Rhodesia, and Southend in both directions.

Mr Max Wilson, founder of the club, explained that the club was a closed group providing accommodation and other amenities for its members. For the first two years of its existence it had no travel facility, and this had been introduced at the suggestion of an airline (unnamed) that the club might like to provide facilities for members to book passages. Its membership did not exceed 20,000, and there were branches in various Commonwealth countries. The club catered for younger members of the community, many of whom would not be able to travel but for the club's facilities. Did this not tend to show that travel was a primary facility of the club? Mr Wilson replied that this was not so; members could not travel under club auspices for the first six months of membership.

Pressed further on the point that travel might be a primary object of club membership, Mr Wilson was asked to explain an undertaking to make a refund on his subscription to any member who had to cancel his trip. Mr Wilson replied that of the present membership of 16,000 he did not expect that more than 1,500 would travel, by sea or air, an estimate that seems a little hard to reconcile with a Union Castle ship charter by the club on which 748 passengers were carried, and Mr Wilson's revelation that negotiations for four more ship charters during the off season were in hand. Clearly the Board wished to satisfy itself thoroughly that bulk travel is not a primary facility offered by the Overseas Visitors Club. [*Stop press:* The application was granted.]

THE BOARD'S NEW DEPUTY CHAIRMAN

SINCE our note last week recording the appointment of Mr J. J. Taylor as a member of the Air Transport Licensing Board, the Minister, Mr Peter Thorneycroft, has confirmed that, as from August 1, Mr Taylor will be deputy chairman of the Board. He succeeds Mr A. H. Wilson, who has been filling the office on a temporary basis. Mr Wilson will remain a member of the Board.

Mr J. J. Taylor is general manager and secretary of the Workers Travel Association, and an old hand in British air transport licensing affairs, having been a member of the Air Transport Advisory Council from 1952. Mr Taylor's appointment as a member of the ATLB took effect on June 1.

SILVER TURNBUCKLE FOR HARDINGHAM

MR R. E. HARDINGHAM, secretary and chief executive of the ARB, was presented with the Silver Turnbuckle award of the Society of Licensed Aircraft Engineers by the society's President, Mr I. J. Gregory, AFRAeS, chief maintenance engineer of BEA, at the society's 18th annual general meeting on June 3.

Presented from time to time for outstanding services in aircraft engineering, the Silver Turnbuckle is the society's pre-eminent award, and comprises an authentically dimensioned Avro Turnbuckle fashioned in silver from the original drawings and mounted in a presentation case. The SLAE Gold Badge for 1960, awarded annually to the author (being a member) of the most meritorious paper published in the society's *Journal*, went to Mr P. Hobley, manager of the instrument services department of RCA Victor Ltd, Montreal, for a paper entitled "An Introduction to the Reliability Concept."

The SLAE General Council is to proceed with the postal balloting necessary to reconstitute the society on April 1, 1962, as "The Society of Licensed Aircraft Engineers and Technologists."

ICAO's ALPHA PLUS

LATEST annual report of the International Civil Aviation Organization shows how an enterprise the size of a medium-sized charter operator, and having no executive power, stands for law and order in a £2,000 million industry.

THE early summer of each year sees the publication of a document which is as interesting and useful as any other in the growing body of aviation literature—the annual report of the Council of ICAO to the Organization's General Assembly. This report serves two quite separate purposes: on the one hand it offers the most authoritative and comprehensive account of the industry's recent progress; on the other hand, it gives a complete record of the activities of ICAO itself.

The report itself is traditionally divided into eight chapters, followed by a few appendices relating mostly to the Organization's composition and internal arrangements. To the industry at large the opening chapter is likely to be the best read, for it consists of 21 packed pages on the industry's development in 1960. Of the remaining seven chapters, the most important are those two which deal with the subjects closest to ICAO's heart—air navigation and technical assistance.

Civil Aviation in 1960 This important chapter opens by observing that 1960 was noteworthy in two particular respects. The year saw long-range routes taken over in the main by jets. And as if that wasn't enough for one year, 1960 also saw the industry starting to look seriously at the supersonic airliner. Traffic in 1960 increased by 13.6 per cent over 1959, a rate which corresponded closely with the average over the past ten years—a rate equivalent to a doubling of traffic every six years. International traffic continued to expand faster than domestic (growth rates in 1960 of 21 and 9 per cent respectively), this trend resulting in a further increase in average passenger-haul to 640 miles. The slow domestic growth was largely attributable to the lethargy in the North American economy: because of this, the share of world traffic carried by US airlines dropped to below 60 per cent for the first time since World War II.

Despite this substantial overall growth of traffic, load factors fell sharply to the lowest level in the past decade—55.5 per cent. As ICAO forecast a number of years ago (to the annoyance of many governments and airlines) the advent of the jets was accompanied by an over-abundance of capacity. This was even apparent on the fastest-growing route of all, the North Atlantic, where air traffic climbed by 25 per cent to but a shade short of two million passengers. By comparison, the shipping total fell for the third successive year to about 870,000. Although average revenue rates are estimated as having risen by almost 2 per cent to 52 pence per l.t.m. at a time when units were held constant at an estimated 29 pence per c.t.m. (both figures being largely biased, of course, towards American domestic experience), the fall in load factor was enough to drag the level of operating profit down to negligible proportions. In the absence of precise financial figures, the Organization calculates that the industry made a global operating profit of $57m (£20m) on revenues and expenditures that were respectively just over and just under a figure of $5,000m.

Not only from a financial viewpoint, but also in respect of safety rates, 1960 marked a step backward rather than forward. Sched-

Malayan interest in the Avro 748 is exemplified by this picture of the Federation's Minister of Transport, the Hon Inche Sardon Bin Haji Jubir, at Manchester after a demonstration flight in the prototype. With him is Mr E. Galitzine, Avro's sales manager (left) and J. G. Harrison, Avro's chief test pilot (right)

New Convair 880 deliveries include this one (top) for Civil Air Transport of Formosa. It will go into service next month as the "Mandarin Jet." Only the one aircraft is on order. Below, the new Venezuelan international carrier, Viasa (formed out of the merger of the international interests of Avensa and LAV) has two Convair 880Ms on order, the first of which is seen here emerging from the San Diego factory

uled services suffered the unprecedented number of 32 fatal accidents involving the tragic record of 857 passenger fatalities, equivalent to 1.24 fatalities per 100m passenger-miles or 0.36 fatal accidents per 100,000 aircraft hours flown. This deterioration was not due to the new jets—which showed the best rates for any class of aircraft—nor to the turboprops which, despite a bad year, showed a rate which was not quite as bad as piston-engined aircraft. If anything, the deterioration reflects the possibility that "1959 was an exceptionally good year in this respect, rather than that the year 1960 was exceptionally bad." Nevertheless, the 1960 figures are ominous in that they show the severity of accidents to be increasing with the advent of larger aircraft, particularly in respect to landing accidents.

By the year's end the world's entire airline fleet (excluding USSR and Communist China) had grown to 5,014 aircraft of which jets numbered 388 and turboprops 723. Most numerous were the apparently irreplaceable 1,296 DC-3s. Although the turbojets numbered only 8 per cent of the total fleet, their productive capacity represented some 30 per cent of the total, while jets and props together represented 50 per cent of total capacity.

If not yet shown in any fleet records, supersonic airliners were nevertheless very much in mind, partly as a result of the capable ICAO study into the consequences of supersonic travel which was completed during the year. This report, summarized in *Flight* for September 16, 1960, was notable for its cautious tone.

A field in which considerable progress took place in 1960 was inter-airline co-operation. A particularly interesting pool agreement was that between three Brazilian carriers operating between Rio de Janeiro and Sao Paulo. Under this pool a daily total of 60 flights were operated in each direction at a fare of $7.50 for a journey equivalent in length to London - Paris. This service attracted an average of 3,000 passengers daily. Another development was the equipment pool, of which two were developed during the year, one for Boeing 707s, the other for DC-8s. Contrary to this trend towards greater collaboration was the slow progress of the Air Union project.

Another field to show progress was that of statistical reporting. For the first time, figures were made available for Aeroflot. These showed that the Russian airline carried 20m passengers in 1959, the most densely travelled route being Moscow - Leningrad which bore ¼m passengers in the twelve months ended mid-April 1960.

Developments in the field of air navigation are reviewed, ranging over such diverse subjects as improvement in flight planning techniques; automatic and semi-automatic landing; slush on runways; the increasing problem of over-run, particularly on wet runways; noise suppression; research into clear-air turbulence; and the need to consolidate air traffic control zones into larger areas.

THOUGHTS AFTER A HEARING

ON pages 837 and 838 is our fourth review of the Cunard Eagle *versus* BOAC North Atlantic case. It went on much longer than had been expected: instead of three sessions there were six, the last one being on May 30, and the total elapsed time was 18¾hr.

In retrospect, the outstanding impression was of the barrage of statistics fired by both parties at the Board and at each other. The fact that one distinguished observer was seen to be asleep, or apparently asleep, for about 15min during one session does not diminish the importance of statistics, because air transport cannot be properly regulated without a detailed analysis of economic and traffic matters. This hearing went to statistical extremes, particularly in the realm of forecasting. But this is no bad thing; as time goes by a sort of methodology will evolve whereby the facts are stated with the minimum of pedantry and long-windedness.

Alas, there are no signs that the Board has the staff *independently* to analyse these issues for itself. This is the Board's greatest weakness, but it is to be congratulated on its attentiveness throughout the statistical barrage at this hearing.

It was interesting to see that the Board allowed discussion of traffic rights, as of course it had to do. Such matters are not among those that the Board *must* consider in particular (section 2(2) of the Act). But those words "in particular" do not preclude discussion of anything—and of course Section 2(3) of the Act says that the Minister and the Board shall "consult" from time to time on traffic rights matters. The old ATAC was specifically required to take traffic rights into account, but not the new ATLB. In drafting the new legislation the Minister obviously intended that traffic rights should be his prerogative, and it was only during the progress of the Act through Parliament that the concession about consulting was popped in.

Professor Jack was right to allow discussion of traffic rights, and though the Board is not specifically directed to do so in its terms of reference, there is sufficient elasticity in the wording of the Act to allow him to justify himself to anybody in the Ministry who might complain that discussion of foreign policies in public can be politically embarrassing and compromising.

Compared with what is to come, this was a relatively straightforward case. Nobody denied that there is plenty of traffic on the route, and it is a route where, because a Bermuda-type agreement is in force, and because there are two American carriers against one British carrier, the political issues are not—compared with Europe—delicate.

There was little remarkable about the hearing other than the importance of the issues at stake. The proceedings were conducted with the "reasonable informality" which Professor Jack seems to sustain so admirably, and there were no moments of drama. Practically the only light relief was provided by the electric clock electing to go backwards at one stage of the proceedings.

UNSAFE AT SIXTY?

IF ICAO approves recent recommendations of its Personnel Licensing and Medical division, one effect would be the introduction of an international standard proposing the revocation of an ALTP licence after the age of 60. The American FAA, it will be recalled, has already implemented such a rule.

Another proposal affecting the ALTP licence as well as the commercial and senior commercial licences seeks to establish an international standard whereby electrocardiography will form part of the heart examination for the initial licence. This would apply at every fifth annual renewal up to 40, and every second year thereafter. Private pilots and air traffic controllers would also require an electrocardiogram for their first licences and for certain renewals.

After some discussion ICAO has decided not to encourage the general use of contact lenses by aircrew. Because of possible dislodgement, by sneezing or rapid eye movement, and the danger of corneal damage during removal of such lenses, it is thought that their use should be restricted to special cases.

Apart from the medical aspect, the international standardization of all licences has been under consideration and ICAO feels that all member states should be made aware of one another's standards. Specific reference is made to the increasing number of private pilots travelling abroad, who might wish to hire "self-drive" foreign aircraft for business or pleasure.

Only rarely do photographs taken inside Soviet hangars reach the western world, so that this shot of a Tu-114 (with what appear to be two others behind) is of unusual interest. According to an Aeroflot pilot who was at the Paris Salon, ten Tu-114s are now in service.

AIR COMMERCE . . .

HOW GROWS IT IN EUROPE?

INTRA-EUROPEAN traffic is the rather cumbersome phrase used for describing traffic carried on international routes originating and terminating within the geographical area covered by the European continent and countries bordering the Mediterranean. The important exception is domestic traffic. The voice of the airlines who carry intra-European traffic is the Air Research Bureau,* colloquially known as "the other ARB." This organization has just published its intra-European traffic results for the calendar year 1960, and the story is told in the table below.

The first item to be looked at is the tell-tale load factor, the index of economic health. It is seen that it slipped slightly, to 57.9 per cent (seat load factor). This is not too comforting a figure, especially when it is borne in mind that the load factor achieved by BEA, which carries about a quarter of intra-European traffic, was 65.4 per cent. Clearly, some of the other member airlines of the Air Research Bureau suffered depressingly low load factors. Of course, the meaningfulness of load factor on intra-European routes is distorted by the fact that, on routes where there is more than one carrier, the parties are usually in pool. To those who complain that they can never get a seat—and it is our impression that more and more people are complaining thus—a load factor of 57.9 per cent would seem to be the airlines' answer, though it is hardly a vindication of the old argument that pooling increases load factors.

Another highlight in the table is traffic growth, which was more than 19 per cent. This compares with the worldwide growth rate for international scheduled services in 1960 of 21 per cent (see pages 842 and 843).

*Members, in addition to BEA, are Aer Lingus, Air France, Alitalia, Lufthansa, Finnair, Iberia, Icelandair, KLM, SAS, Sabena and Swissair.

INTRA-EUROPEAN SCHEDULED TRAFFIC, 1960

Passenger Traffic	Seats ×1,000	Pass ×1,000	Seat-km ×1,000,000	Pass-km ×1,000,000	Load factor (per cent)	Average stage distance per pass (km)
First-class	1,626.1	713.2	1,222.9	537.3	43.9	753
Tourist-class	16,102.9	9,382.4	8,917.0	5,333.3	59.8	568
Total	17,729.0	10,095.6	10,139.9	5,870.6	57.9	581
Change over 1959	+19.6 per cent	+19.2 per cent	+19.8 per cent	+19.2 per cent	—0.3 per cent	0.0

Freight and mail	Mail (tonnes)	Freight (tonnes)	Mail (tonne-km ×1,000)	Freight tonne-km ×1,000)	Average stage distance (km)	
					Mail	Freight
Passenger and all-cargo flights, Total 1960	27,088	137,743	17,934	81,945	662	595
Change over 1959	+7.0 per cent	+17.9 per cent	+7.3 per cent	+14.9 per cent	+1	—15

Of particular interest, too, is the ratio of tourist-class to first-class passengers. Individual airlines do not disclose how they distribute their air transport services between these two different kinds of market—not even BEA, the most informative reporter of all the world's airlines. But it will be seen that, taking the European airlines as a whole, for every passenger who flew first-class ten travelled tourist-class. More useful as a measure of revenue earned is this ratio expressed in terms of passenger-km: the ratio was roughly the same in these terms, though it will be seen that the first-class passenger flew a rather longer stage distance, 753km (about 470 st miles) than did the tourist-class passenger, 568km (about 355 st miles).

The figures shown in this table are not comparable with those published by BEA, or by other individual airlines, because they involve a lot of double, treble and even quadruple counting: the passenger statistics relate to sector passengers, so that Mr Smith who flies from London to Rome *via* Paris and back appears in the records as four passengers.

JET INSURERS FOREGATHER

PERHAPS not unexpectedly, a sombre view of the jet age safety record was taken at the annual general meeting of the International Union of Aviation Insurers recently held at Montreux, Switzerland. Mr. R. H. Jennens of the British Aviation Insurance Co, president of the meeting, recalled his "wait-until-the-winter" warning last year. This warning, he says, has been "fully justified" in view of subsequent jet hull losses (two DC-8s and two 707s). Mr. Jennens thinks that underwriters must expect winter loss peaks, although a trend towards overall improvement might be expected.

Mr Jennens recalls that jet accidents last winter totalled approximately $30m, equalling in value all the losses in the two preceding years and bringing the total world jet loss picture to date to nearly $70m. There are now 500 jet airliners in commercial service and a further 200 are to be added in the next few months. In referring to the immense difficulties involved in moving a large jet from soft ground near the runway after it has crashed, Mr Jennens mentions a possible approach to ICAO by IUAI members to alert world airports to this problem, and to the necessity for a link with local heavy engineering and road-building contractors.

Mr Alan B Hunter, principal surveyor of BAIC, in a paper to delegates, recalls that there have been over 41 significant jet airliner accidents, and 12 aircraft have been totally destroyed. Mr Hunter produces charts to show the relationship between hull losses and world jet flight time, from which the jet accident trend for the next 12 months can be predicted. Mr Hunter feels that the present wrecking rate of one aircraft per 100,000 hours, which would eventually lead to a crash every 15 days when all ordered aircraft had been delivered, cannot continue, and he expects that the worst case for a world result would improve to one accident per 150,000 hours. The best might be of the order of one in 250,000 hours, with very few airlines approaching the best piston-engined results achieved of one wreck in 500,000 hours.

Mr Hunter suggests that, as a new approach, underwriters might study flight time rather than calendar time to assess their position. Airlines could be called upon to submit their forecast of jet flight time for 12 months when insurances are renewed, and those airlines whose accident rate remained at around one per 100,000 hours or worse are "clearly deserving of harsher treatment than those whose approach to jet operations brings good results."

"TO HECK" WITH BERMUDA PRINCIPLES

AS noted in these pages a fortnight ago (June 1, page 773) the chairman of the US Civil Aeronautics Board, Mr Alan S. Boyd, has said: "It is questionable in our minds whether we can hold on to the principles of the Bermuda Agreement." He was speaking on March 23 to a House Appropriations Sub-Committee.

The Bermuda agreement, it will be recalled, was a 1946 compromise between the British and the American viewpoints. This country thought that capacities and frequencies should be controlled; the Americans, who held the dominant air transport position, advocated freedom of the air. The Bermuda agreement did not, like most other subsequent bilateral agreements, put an arithmetical restriction on the capacity offered by either side. Instead it talked of capacity being related to traffic, of fair and equal opportunity for both partners, with *ex post facto* reviews if one side felt that the other was hogging all the traffic.

Now that so many flag-carriers are in a position to exercise reciprocal traffic rights in the USA, the Americans are having second thoughts about the Bermuda principles. Though they have always shunned predetermination, they are now tending, in defence of their own airlines, to be more restrictive. According to Mr Boyd, as reported by *Aviation Daily*, "disagreement over fifth-freedom rights, multiple designation and capacity limitations, and a growing reluctance of many countries to engage in *ex post facto* reviews have all helped to weaken the Bermuda principles." Under Bermuda-type agreements, Mr Boyd says, "any country can put on as much capacity as it wants to without any prior restrictions . . . Today a number of countries with whom we have Bermuda-type agreements say 'to heck with the agreement, you cannot put on a new schedule, we will have to talk about this first.' " The result has been "a tremendous amount of trouble" and US carriers had been put in a "loss position" in many parts of the world.

PIPES OF PANAM

MOST airline reports for 1960 are striking a somewhat apologetic note, falling profits being generally attributed to circumstances allegedly beyond an airline's control. A cheering exception to this trend is provided by Pan American World Airways Inc, who use their latest annual report as a platform to indulge in a spirited programme of trumpet blowing.

In the case of PanAm, to blow one's own trumpet at the present time is a peculiarly justifiable exercise. As the airline primarily responsible for the introduction of large jets and for the introduction of tourist-class and economy-class fares on international routes, PanAm can rightly claim to be the world leader in international air transport. Not only that, but they also happen to be the largest carriers of international air traffic in the world. And as if that were not enough, they happened to enjoy a remarkably successful year in 1960 when lesser mortals were invariably struggling to make ends meet (or appear to meet).

Last year saw PanAm carry 3½ million passengers an average distance per passenger of almost 1,500 miles. Together with 137 million ton-miles of freight and 60 million ton-miles of mail, this, yielded traffic revenues amounting to $408 million. Other odds and ends brought the airline's total revenues to $413 million (£147m), a figure which includes not a penny of subsidy. In terms of revenue, PanAm is entitled to describe itself as the world's largest *international* airline. Largest revenue-earner of all in 1960 was American

FAA certification of the CL-44 was due today, June 15. Here Mr F. B. Lynott (right) of Flying Tiger accepts on May 31 at Montreal the first of ten CL-44s from Mr F. R. Kearns of Canadair. Original contract actually called for delivery of three in May, but completion of the order will still be in September. Tiger's first three 44s will be passenger-cargo aircraft with provision for 149 seats. Deliveries are scheduled soon to Seaboard (five due to enter service July 1) and Slick (two, with a repeat order for two probable)

($428m). On their revenues of $413m, PanAm obtained an operating profit of $25 million, up by over 50 per cent on the figure for 1959. Shareholders and tax gatherers, however, have to be satisfied with an unchanged harvest ($5 million and $7 million respectively), for the lion's share of the increased profits had to go into the pockets of the banks, insurance companies and debenture holders who have been primarily responsible for financing PanAm's entry into the jet age.

Normally 1960 would have been a bumper year for PanAm, for revenue rates rose on average by 1 per cent while unit costs were slashed by no less than 11 per cent to 32 cents (27 pence) per c.t.m. (a reduction attributed to the efficiency of the company's new jets, particularly since the new engine overhaul base at New York International came into full operation). The factor that rubbed the gilt from the gingerbread was a sharp fall in load factor from 66 to 59 per cent—the first time for many years that PanAm's load factor had dropped below 60 per cent. This drop is ascribed to "the business recession and to delivery of jet equipment to foreign flag competitors".

This is not PanAm's only warning sounded on the foreign flag carrier menace. The recent decision by the Defense Department to move more military traffic by scheduled US carriers rather than by MATS is applauded as a measure which will provide "needed support against the competition with low-wage foreign flag carriers." Then again, considerable emphasis is given to the loss of US foreign exchange reserves that results from the use of foreign airlines instead of PanAm. These warning notes are obviously directed towards the more politically inclined among the readers of the airline's report.

KLM's NEW PRESIDENT

ONLY the third president of KLM in the airline's 42-year history, Mr Ernst H. van der Beugel, KCMG, succeeded I. A. Aler as head of the Dutch airline last week. Unlike his predecessor, Mr van der Beugel is an economist, not a pilot, by training and has held a succession of Dutch government posts. In January, 1957, he was appointed Deputy Minister for Foreign

Left, seen at Hiller Aircraft Corporation, Palo Alto, with a Model E4 is Mr Alan Bristow, director of British United Airways. As reported last week, he was there to sign an order for 12 Hiller 12Es. Right, how to have lunch in Birmingham after a morning appointment in London: Mr Alfred Robens, chairman of the National Coal Board, recently flew by a BUA Widgeon from the Westland heliport to Birmingham, where he arrived 50min later

AIR COMMERCE . . .

Affairs, besides acting as chairman of the Co-ordinating Committee for the Common Market and Integration. In March, 1957, he headed the Dutch delegation during negotiations in Washington which resulted in KLM getting traffic rights at Houston, Texas.

Of such rights KLM's new president says: "It has become a sort of horse-trading, which is really no longer appropriate in a world that thinks and acts more and more multilaterally. The outsider has no idea how many restrictions bar the way to freedom in the air." Mr van der Beugel's considerable diplomatic and economic experience should be a great asset to KLM in this respect.

AIR TRANSPORT AND THE RAE

SPEAKING at the Royal Aircraft Establishment, Farnborough, on June 8, the director, Mr M. J. Lighthill, FRS, said of the Establishment's transport-aircraft work that a large number of advances were imminent. RAE had been working on supersonic aircraft for five years, recently with the British Aircraft Corporation and previously with many companies, and were "very pleased with the way the design study is going." Such an aircraft should make three-hour transatlantic flights at a cost very near that of the present big jets.

He said "we are interested in collaboration with the French. They are interested in a medium-range aircraft and we are interested in a long-range machine. Many problems in developing these two aircraft are common problems." It was hoped that the sharing would extend to markets as well as to design and development.

Answering questions, Mr Lighthill said that it was not known when the supersonic transport aircraft would be built, but it seemed that BAC could handle the project in its stride, and he would expect it to be in service towards the end of the decade.

Mr Lighthill said that the use of helicopters for city-centre to city-centre operation seemed particularly promising. The MoA felt that the noise problem could be overcome, and had been impressed with recent Rotodyne tests into London (which "caused practically no public comment"). They were optimistic on the noise problem for helicopters and other VTOL aircraft because (a) operating techniques were being improved with this in mind and (b) "we have several things up our sleeve," such as engines with higher by-pass ratios.

He said that VTOL and STOL machines would be important in both military and civil fields. On the civil side, they could not see the exact shape which the civil VTOL aircraft would take, but they had an important future.

Another important development was blind landing, and this was an area where Britain had a clear lead over the rest of the world.

First scheduled flights by the three ex-Silver City Superfreighters now operated by Compagnie Air Transport started on June 5 on routes from Le Touquet and Calais to Lydd and from Cherbourg to Hurn. The aircraft are French-registered and flown by French crews, and operate in pool with Silver City. Background to the partnership was given in "Flight" for February 24. Majority shareholders in Cie Air Transport are French Railways, Air France and French Lines. No further information was available last week about progress with the two-mile rail spur being built by French Railways into Le Touquet Airport

IMPROVING TURBOPROP CONVAIRS

AIRESEARCH AVIATION have engineered and installed in an Allegheny Airlines Convair 540 (Napier Elands) a gas turbine AP system which makes the aircraft independent of ground support. The rig provides pneumatic and electric power for starting, ground air-conditioning in the cabin and systems-checking, all of which reduces turnround time and ensures constant passenger comfort.

The AiResearch gas turbine is mounted in the tail cone (now depressurized), and other modifications include new ducting, wiring and controls.

Canadair have fitted this equipment, as an AiResearch kit, to two 540s of Quebecair, and are making it standard on all their future Convair conversions.

BREVITIES

During May Sabena carried its 300,000th scheduled helicopter passenger since services began in 1953.

Aerolineas Argentinas suspended its 5,600 employees on June 7 and grounded the entire fleet, as a result of a go-slow strike which had disrupted services since May 29. Operations began again on June 10.

In the House of Commons last week the Attorney-General described as "completely without foundation" an MP's allegations about Mr Frederick Beazley of Falcon Airways (*Flight*, last week).

Japan Air Lines has ordered a DC-8-50 (P & W JT3D turbofans) to replace the aircraft, one of the fleet of five Series 30s, that was damaged beyond repair at Tokyo Airport on April 24 (*Flight*, May 4, page 608).

It is reported that Sud-Aviation is considering the possibility of partial public financing of the Super Caravelle. It may offer 5 per cent preference shares, guaranteed by the Government and called the Caravelle Loan.

On July 17 Anglo-UAR talks will begin in Cairo. One of the subjects likely to be raised is United Arab Airlines' bid for fifth-freedom rights between London and New York.

It is thought likely, as this issue goes to press, that the Ministry of Aviation will shortly issue a statement about the near-miss between a UAA Comet 4 and a TCA DC-8 over London Heathrow on February 21.

The ATLB has granted British United Airways' application for a licence to operate from London Gatwick to Guernsey or Jersey. The frequency is limited to two round trips on June 3 and June 10 and September 23 and September 30. The original application was for six round trips a week from June to September each year until 1966.

Anglo-American talks to discuss the future of traffic rights in the Caribbean opened in London on June 7. According to a source in Washington the forthcoming independence of the West Indies Federation may mean that BOAC will not be able to continue to exercise its US - West Indies traffic rights as at present, and that these may have to be allocated to BWIA.

Left, Capt Jack Brannon has been awarded the Royal Aeronautical Society's Alan Marsh Medal for 1960 for his "outstanding achievements in piloting helicopters." Stationed in Abadan, he flies Whirlwinds for British United Airways

Right, the Renault 4 c.v. seen here is not a Dinky toy, but any car would be dwarfed by this first prototype of the FAA's "mobile lounge." It is intended for use at the new Washington Dulles Airport, due to open in October 1962, the idea being to take the terminal to the aeroplane. The FAA is said to have spent $250,000 on this prototype, more than twice the original estimate

The new Whirlwind Helicopter powered by the Gnome gas turbine engine has greatly increased power available at a much lower aircraft weight. The 1050 horse power of the de Havilland Gnome engine gives the Whirlwind exceptional high altitude and hot weather performance. The aircraft weight has been reduced by 650 lb compared with the piston engined version. The Gnome Whirlwind can fly 90 miles, pick up eight survivors and return to base with ample fuel reserves. The engine power permits landing at 10,000 ft with full load in conditions up to temperate maximum. Freight loads of 2,000 lb can be carried or six stretcher patients together with a medical attendant. The large cabin makes the machine an ideal aircraft for a wide range of duties including 8-10 seat passenger transport, freighting, casualty evacuation, rescue and anti-submarine defence.

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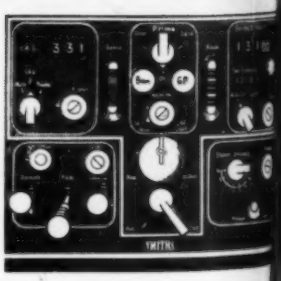

rt approach . . .

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SMITHS embarked five years ago on a new generation of automatic pilots, designed to increase the safety factor to a level that will meet the stringent safety requirements that the civil air lines need for automatic landing.

SMITHS latest-generation automatic pilots will be the heart of the automatic system to be fitted in the de Havilland 'Trident' (under construction for BEA) and the Short 'Belfast' heavy freighter (on order for RAF. Transport Command). Negotiations are in progress with other operators.

SMITHS automatic landing equipment has been ordered by the USA. Federal Aviation Agency for evaluation tests in America.

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FOKKER–THE MAN AND THE AIRCRAFT

By HENRI HEGENER

COMPILED AND WRITTEN BY THE LEADING DUTCH AVIATION WRITER—HE WAS FOR 28 YEARS EDITOR OF "HET VLIEGVELD" MAGAZINE OF THE ROYAL NETHERLANDS AERO CLUB—EDITED BY BRUCE ROBERTSON, PRODUCED BY D. A. RUSSELL; ILLUSTRATED WITH NO LESS THAN 49 1/72 SCALE, 3-VIEW DRAWINGS OF FOKKER AIRCRAFT (FROM THE M.1 TO THE F.27 "FRIENDSHIP") DRAWN BY J. D. CARRICK, FRANK YEOMAN AND BILL HEPWORTH; THIS MAGNIFICENT BOOK WILL BE PUBLISHED EARLY JULY NEXT. ORDER YOUR COPY NOW FROM ANY W. H. SMITH BOOKSHOP, YOUR LOCAL BOOKSELLER, OR THE PUBLISHERS.

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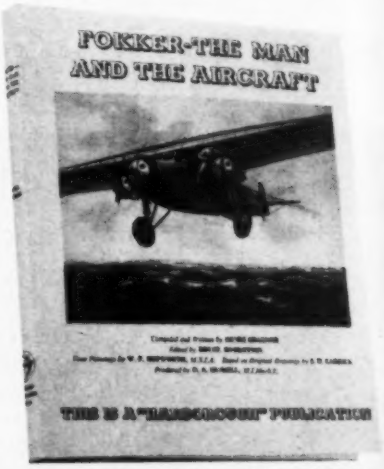

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Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Passenger Mileage

APROPOS "1961 Safety Record so Far" (*Flight*, May 18), airline traffic statistics based on "passenger-miles" are surely now well out of date.

"Passenger-miles" was a term used in the early 1920s to make the air traffic of that day look a lot more than it really was. A publicity boost, if I may say so.

When an aeroplane with a few—say five—passengers on board flew let us say from Croydon to Le Bourget it looked more impressive to record it as "1,200 passenger-miles" than "five passengers were carried on a two-and-a-half-hour flight," so it became a silly habit always to report the week's activity in terms of "passenger-miles."

Now that aeroplanes carry so many more passengers per flight (up to 100 or so), on routes so very much longer and infinitely more frequent, the "passenger-mileage" nonsense runs into astronomical figures, which become incomprehensible and, of course, misleading.

A "short-haul" aircraft on a two hundred miles' route carrying sixty passengers has to do five trips (making a total of three hundred passengers carried) to equal a "long-haul" aircraft on a one thousand miles' route carrying sixty passengers, on the "passenger-miles" reckoning.

In the event of a total-loss accident, the accident rate in actual fact would be, in the case of the "short-haul" business, one per five passengers carried and in the "long-haul" case it would be one per one (or the lot); whereas—assuming of course the full route miles had been completed—on the "passenger-miles" basis in each case it would be one per 1,000 passenger-miles, which is absurd.

With millions of people now regularly travelling by air, the accident rate would look quite as well if expressed without the mileage multiplication.

Glasgow SW2 E. D. AYRE

Commemorating Pioneer Names

APROPOS the presentation to the Shuttleworth Trust of the Percival Gull Six (G-ADPR) by Hunting Aircraft, readers may be interested in another permanent record of Miss Jean Batten's historic flights.

As we passed through Auckland, New Zealand, *en route* to England from Australia via Panama, we were delighted to see that this city had not forgotten Jean Batten's 1936 flight from England to New Zealand in 11 days (following her solo flight to South America the previous year). For these epic contributions to aviation Miss Batten received the Britannia Trophy for two successive years—1935 and 1936—and later was made a CBE.

Whilst appreciating that odd streets and occasional blocks of flats bear the names of Air VCs, there seems to be room for much improvement in commemorating our pioneer airmen and airwomen. Where, in the UK, can one find any link with Jean Batten, Amy Mollison, Jim Mollison, O. P. Jones and the many others who led the way to the safe and smooth flights we now enjoy in the hands of our commercial airlines?

Leigh-on-Sea, Essex LESLIE HUNT

Auckland, NZ, tablet commemorating Jean Batten's 1936 flight from England (letter from Mr Leslie Hunt, above)

Realism in a radio-controlled flying scale model and—photographically—even in the "airfield" surface (see letter from Mr D. E. Thumpston)

Flying Scale Models

I NOTED with interest, in *Flight* for June 1, Sqn Ldr Crampton's article on his C.1160 radio-controlled flying scale model. Without wishing to burden you unduly with modelling matters, it occurred to me that it might be of interest to your readers to learn that the first competition for radio-controlled flying scale models to be held in this country took place at RAF Wellesbourne Mountford on May 7, being part of the Sutton Coldfield Radio Control Model Aero Club's first annual rally. This attracted a varied field of beautifully constructed models, ranging from a Fokker D.VIII to a Luton Minor, and judging was carried out by J. M. Bruce and N. Butcher.

The flying of radio-controlled scale models has been a particular interest of mine for the past three years and types flown include the BE2e, the Fokker Eindekker and the Sopwith 1½-Strutter. This latter, which is fully detailed and closely follows full-size construction, including rubber cord shock-absorbing undercarriage, has recently completed flying tests and performs beautifully, take-offs and gentle landings being a joy to behold.

Flying characteristics of these models are very similar to those of their full-size counterparts, this being particularly noticeable in the 1½-Strutter's high degree of stability, resistance to sudden change of attitude in the air, and flat glide and float prior to touchdown. I enclose a photograph [reproduced above.—Ed] of this one-eighth-scale model, which is powered by a 2.5 c.c. engine and has thus far logged one hour's airborne time.

Interest in these radio-controlled models has increased considerably during the last year and we can look forward to seeing many more replicas taking to the air in the future. This is certainly a splendid way to reproduce in our own times the spectacle, in realistic flight, of those early aircraft which no longer survive.

Birmingham 13 D. E. THUMPSTON

The Independent Spirit

YOU gave perhaps more prominence than they deserved to a few words I said to the Royal Aeronautical Society's Sixth Air Transport Course at Oriel College, Oxford, in your issue of May 25.

There is one impression that I seem to have given to your correspondent, and possibly to others, which I hope you will allow me to correct. I am quoted as saying that BIATA existed for three main reasons—to make a profit, to give service and to create and maintain reasonable employment. These three reasons for existence I believe apply to the member-companies of BIATA and not to BIATA itself, which is, of course, a trade association and must necessarily only reflect the joint views of its members.

London SW1 L. C. HUNTING
President, British Independent Air Transport Association Ltd.

End of the R.38

FROM an old journal I used to keep 40 years ago, I note that on August 24, 1921, I stood in a street in Hull and saw the sudden destruction of a large British airship, the 2,700,000 cu ft dirigible R.38, during its fourth trial flight.

Although official technical records of this catastrophe no doubt exist, it may still be of interest to some of your readers to hear of my personal observations, as from a "man in the street" on that tragic day, especially now that this type of aircraft is almost forgotten.

I had just stepped out of the building in which I worked when my attention was attracted by the airship's great bulk, roughly a thousand feet up and almost directly above me, shining, a dull silver, in the sun. Within seconds, and before I had time to appreciate the great wonder above me, I was horrified to see a small blood-red flame appear, high towards its upper surface and approximately at a third of its length.

Grim disaster followed at once. Fire spread crackling audibly and fiercely in all directions, tearing its way downwards round the vast belly of the airship, like some ravenous beast savaging its prey. Simultaneously, the great giant's back broke, and whilst the two unequal parts of its body scissored downwards, there issued from the blazing cleavage, with tremendous violence, a fantastic belch of flaming crimson gas. [*Contd. overleaf, foot of page*

THE INDUSTRY

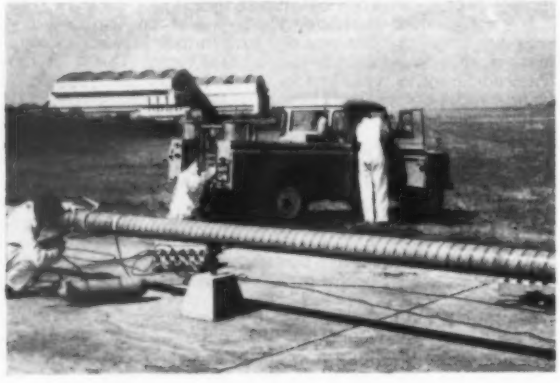
Dr Winny's New Post

IT is announced that Dr H. F. Winny, BSc, PhD, MIMechE, FRAeS, has been appointed chief designer for the Fairey Aviation Division of Westland Aircraft Ltd. Born in 1908, Dr Winny graduated at the University of London with first-class honours. Following study in aerodynamics he obtained his PhD in 1930 and continued in research prior to joining the Fairey Aviation Co. In 1943 he was appointed deputy chief technician and subsequently chief technician, head of design and (in 1950) head of the technical department. Dr Winny has been closely associated with the development of the Fairey Gannet, the Fairey Delta 2 and the Westland Rotodyne.

Interplas 61

NEXT Wednesday, June 21, Interplas 61 is to be opened at Olympia, London, by Lord Hailsham, Minister for Science. This, the sixth International Plastics Exhibition and Convention, remains open until July 1 and is organized for *British Plastics* and *International Plastics Engineering* by Iliffe Exhibitions Ltd. There will be over 350 exhibitors from 13 countries, and among the British companies will be a score whose names are well known in the aircraft industry, either as suppliers or as aircraft firms with plastics divisions. Entrance is free to all *bona fide* trade visitors who have tickets obtainable in advance from the organizers, at Dorset House, Stamford Street, London SE1.

Seen here being installed on an airfield is a 6in-bore Epoch pipeline, manufactured by Bristol Aeroplane Plastics Ltd. This low-weight, corrosion-resistant piping, which is machine-wound from glass filaments bonded with thermosetting epoxide resin, will be one of the company's exhibits at Interplas 61, referred to above



The Duke of Edinburgh recently visited Northern Ireland in connection with Commonwealth Technical Training Week, and while there he inspected the apprentice-training centre of Short Brothers & Harland Ltd. He is seen greeting Mr David Keith-Lucas, technical director; in the background are (left) Mr R. E. Harvey, joint deputy managing director, and Mr H. G. Conway, joint deputy managing director and chief engineer

IN BRIEF

Valay Industries Ltd, makers of Jove Aerowax, Aeroval, Aerowash and Wadpol cleaning preparations for aircraft and other purposes, are now in a new and larger factory, at Davis Road, Chessington, Surrey (Lower Hook 2166).

Cambridge Instrument Co Ltd announce the appointment of Mr K. J. Bush, AMIEE, as assistant sales manager, mechanical thermometer division. They also announce the appointment of Messrs W. C. Orford, S. V. J. Crump and W. A. Hall as assistant resident engineers at the company's branch offices in Nottingham, Bristol and Manchester respectively.

Solartron Electronic Group Ltd have appointed Mr Norrie McFarlane regional manager covering Scotland and Ireland. He joined the company in 1959 as a senior technical sales engineer. The Solartron Group deputy chairman and managing director, Mr John E. Bolton, recently visited the USA and spent some time at Solartron Inc, Cal, who are selling the group's equipment in the United States and producing specialized items based on British designs (see page 840).

Société Anonyme des Etablissements Ed Jaeger, of Paris, have accepted an invitation to become sole representatives in Metropolitan France of Smiths Aircraft Instruments Ltd. An agreement between the two companies covers sales and service of the complete range of Smiths aviation instruments and equipment, including the products of their associates, Kelvin & Hughes (Aviation) Ltd and Waymouth Gauges & Instruments Ltd. Items excluded are spark plugs, igniters and jetpipe temperature measuring equipment, which will continue to be handled in France by Smiths' associate KLG Société Anonyme.

CORRESPONDENCE

(Concluded from previous page)

Of the unfortunate crew (of which 44 British and American officers and men lost their lives) I saw but one member, a most pathetic figure in a white jersey, clinging desperately to the stern section of the ship, in the last few moments left for him to live. With imminent death approaching from above and below him, the heart-rending significance of that sunlit pinpoint of white jersey affected me most deeply and I shall never forget it.

The roaring inferno, a gigantic inverted vee of flame, went down behind my close horizon of roof tops, and, by the grace of God, fell into the River Humber and not upon the city. After a pause, tense and silent, fuel tanks exploded noisily in the water and thousands of shattered window panes crashed upon the pavements. The appalling tragedy was over.

Folkestone, Kent — MALCOLM ROBERTSON

Cunarder Chronology

I AM surprised that Mr Geoffrey Dorman (*Flight*, May 25), whose accuracy in writing on aeronautical matters is in my view of the highest order, should let fall the resounding clanger of referring to the *Queen Mary* as the 531.

Surely he means the 534?

Cambridge — DERRICK HANCOCK

FORTHCOMING EVENTS

June	15	RN Air Station Lee-on-Solent: At Home.
June	17	RN Air Station Yeovilton: At Home.
June	17	US Armed Forces Day: Open Day at USAF Bases.
June	17	RAeS Rotorcraft Section: Helicopter Rally and Garden Party, Dunsborough Park, Ripley, Surrey.
June	17	Opening of Bedfordshire Air Centre, Cranfield.
June	17-18	West Aero Club of France: Wines, Flowers and Chateaux of Anjou Rally, Angers.
June	18	Aosta Rally.
June	18	Private Pilots' Rally, Elstree.
June	24	RN Air Station Arbroath: At Home.
June	24	Bristol Air Day.
June	24-25	RAeC: Invitation Rally for Members and Associate Members, La Baule.
June	24-25	Vichy Aero Club Rally.
June	24-25	"Wings of Joigny" Rally.
June	24-25	Coutances and Channel Central Aero Club: International Rally, Lessay.
June	25	Leicestershire Aero Club: At Home, Leicester/East Oadby.
June	25	Wolverhampton Aero Club: Competitions Day.
June	30	D.H. Technical School Old Boys: Midsummer Ball, Hatfield.
June	30-July 3	Palermo Aero Club: 13th Aerial Tour of Sicily.
July	1-2	RAeC: Invitation Rally, Deauville.
July	5	RAeS Astronautics and Guided Flight Section: "The Use of Satellites for Navigation Purposes," by John D. Nikolaides.
July	6-8	Italian Aero Club: International Aviation Contest, Rome-Turin.
July	7	College of Aeronautics Students' Society: Presentation Ball
July	8	RN Air Station Abbotsinch: At Home.

Vice-Admiral D. P. Dreyer, newly appointed Flag Officer Air (Home), taking the salute at RNAS Culdrose at the recent wings presentation to pilots of No 44 helicopter specialist pilots' course. On the admiral's right is Capt C. L. F. Webb, captain of HMS "Seahawk"

SERVICE AVIATION

Air Force, Naval and Army Flying News

Sir Walter Promoted

A MEMBER of the Air Council since April 1960, Air Marshal Sir Walter H. Merton, KCB, OBE, has been promoted to Air Chief Marshal. A Canadian, he was formerly Chief of Staff, Allied Air Forces Central Europe; and in one of his previous posts had for two and a half years been Chief of the Air Staff, RNZAF.

FAA Re-equipment

A REPORT which first appeared in the *Sunday Telegraph* on June 4, that the Royal Navy was to have three new 50,000-ton aircraft carriers costing £60m each, evoked an official denial from the Admiralty. The report stated that the first of these carriers "could be ready in five to six years" and said that there would be standardization between the Royal Air Force and Fleet Air Arm in radar and weapon systems, with the surmise that future RAF strike aircraft would be equipped to take-off from and land on the new carriers.

VIP Victor

TWO Victors of No XV Sqn are accompanying the AOC-in-C Bomber Command, Air Marshal Sir Kenneth Cross, on his current visit to Australia. The C-in-C, who left Cottesmore last Saturday in one of the Victors, is to have talks with the Ministers of Defence and Air, the Chief of Staff and CAS, and will visit the Weapons Research Establishment at Salisbury and the Woomera rocket range. He returns to the UK by Victor on July 3.

Air Firing Contest

FOR the first time, German, Italian and Norwegian units are joining Netherlands, Danish, Belgian and Canadian teams in the Allied Air Forces Central Europe air-to-air firing competition for the Guynemer Trophy, which is being held from June 26 to July 7, at the Royal Netherlands Air Force base at Leeuwarden. The RAF are not participating.

In an announcement last week about the competition the AAFCE Commander, Air Chief Marshal the Earl of Bandon, said that next year the competition was to be remodelled and would take the form of a fighter-bomber meet between the two Allied Tactical Air Forces under AIRCENT on similar lines to the Royal Flush reconnaissance competition.

The air gunnery competition involves selected air and ground crews from the participating air forces and is designed to test pilot-ability, team efficiency and the operational effectiveness of supporting ground units. The Guynemer Trophy for which the teams are competing has been won for three years in succession by Canadian teams from RCAF bases in Europe.

Air Chief Marshal Sir Walter H. Merton (below left), whose recent promotion from air marshal is recorded above; and Air Marshal Sir Hugh Constantine, who as briefly recorded in "Flight" last week is to be Commandant of the Imperial Defence College

V-bombers to Florida

TWO Vulcans of No 617 Sqn went to Florida last weekend to take part with USAF aircraft in a "Golden Anniversary of Naval Aviation" display at Pensacola air base on June 10. All naval aircrew who trained there during the war, including British aircrew, received invitations to attend. One of the Vulcans, flown by Sqn Ldr D. B. D. Hamley, put on a demonstration; the other, piloted to Pensacola by Flt Lt R. S. Trigg, was on static display. The Vulcans reached Florida on June 8 and were due to return last Monday.

Visiting the USAF

AIRCRAFT from Fighter, Bomber and Flying Training Commands are taking part in displays next Saturday (June 17) at USAF bases when these are open to the public for Armed Forces Day. The royal blue Hunters of No 92 Sqn will be at Bentwaters and Wethersfield; Lightnings of 74 Sqn at Mildenhall and Sculthorpe; and Jet Provosts from the Central Flying School at Alconbury (where there is to be a parachute drop by aircraft and personnel from No 1 Parachute Training School at Abingdon) and Mildenhall. A Victor and a Vulcan are to fly over all five "open house" USAF bases. A note on the bases to be open appeared on page 782 of last week's issue.

Gp Capt Merifield

A NOTABLE record as a reconnaissance pilot marked the wartime career of Gp Capt J. R. H. Merifield, who lost his life in a helicopter accident near Upavon on June 1. He was awarded the DFC in June 1942, the DSO in February 1944 and a Bar to his DFC eight months later. In 1945 he set up transatlantic speed records in a Mosquito, flying westward to Newfoundland in 6hr 58min and eastward back to Cornwall in 5hr 10min; in the Korean War, attached to a USAF Sabre wing, he won the Air Medal. Aged 41, he had only recently joined the Transport Command air staff after returning from Aden, where he commanded RAF Khormaksar.

VTOL for the RAF

IN the House of Commons recently the Under-Secretary of State for Air, Mr W. J. Taylor, said that an operational requirement had been drawn up for a VTOL ground-attack aircraft. He was answering a question addressed to the Air Minister, asking what further consideration had been given to the development of vertical take-off and landing fighter-bombers and long-range bombers for the Royal Air Force. Mr Taylor said that following the Minister of Defence's recent meeting with the German Minister of Defence, there was to be joint development of an aircraft based upon the Hawker P.1127. There were no plans to introduce a VTOL long-range bomber.

Birthday Honours

DETAILS of the highest-ranking RAF awards in the Queen's Birthday Honours are given on page 820. The names below are of RAF personnel and members of its allied Services who have received honours and awards from the OBE and AFC onwards.

ORDER OF THE BRITISH EMPIRE

Knight Commander: Acting Air Marshal J. Grandy, CB, DSO.

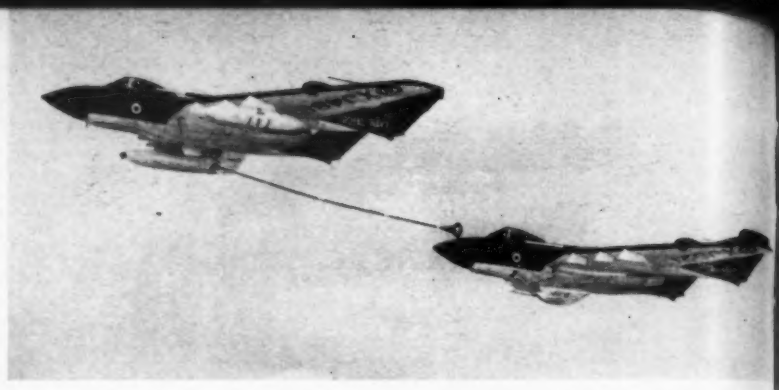
Dame Commander: Air Cmdt A. Stephens, MBE, ADC, WRAF.

Commanders: Air Cdre R. C. Ayling, OBE; Air Cdre E. M. T. Howell; Air Cdre G. H. Morley, OBE, QHS, FRCS, LRCP; Acting Air Cdre D. G. Smallwood, DSO, MBE, DFC, ADC; Gp Capt J. Barraclough, DFC, AFC; Gp Capt R. T. Frogley, OBE, DFC; Gp Capt I. D. N. Lawson, DFC; Gp Capt A. A. N. Nicholson; Gp Capt A. M. Ruston, DFC; Gp Capt T. P. Seymour; Gp Capt I. S. Smith, OBE, DFC.

Officers: Wg Cdr G. M. Beer; Wg Cdr J. I. R. Bowring, MBE; Wg Cdr M. Driscoll; Wg Cdr R. C. Everson, AFC; Wg Cdr C. M. Gibbs, DFC; Wg Cdr M. F. Hatton; Wg Cdr J. T. Lawrence, AFC; Wg Off B. G. Martin, WRAF; Wg Cdr E. H. Roberts, MBE., RAF (retd); Wg Cdr C. K. Saxelby, DFC, AFC; Wg Cdr J. P. Spillane, AMIMechE, AFRAeS, DCAe; Wg Cdr G. J. Storey, AFC; Wg Cdr P. H. Waterkeyn, DFC, Acting Wg Cdr W. A. Beaumont, MA, RAuxAF; Acting Wg Cdr M. Jones; Acting Wg Cdr D. F. Perrens, DSO, DFC, RAuxAF; Acting Wg Cdr J. C. Robertson, MA, RAuxAF; Acting Wg Cdr E. H. H. Stenning, RAFVR; Sqn Ldr D. I. Fryer, MB, BS, BSC; Sqn Ldr E. G. A. Hart.

Members: Sqn Ldr J. P. Balfour, DFC; Sqn Ldr C. C. Bevan, DFC; Sqn Ldr F. Binns; Sqn Ldr F. T. Bishop; Sqn Ldr P. F. Christopher, DFC; Sqn Ldr G. Curry, DFM; Sqn Ldr D. S. Dickins, AFC; Sqn Ldr D. Fitzgerald, DFC; Sqn Ldr C. Higgins; Sqn Ldr F. W. Hubbard; Sqn Ldr P. H. Hudgell; Sqn Ldr C. King; Sqn Ldr P. D. Lee, RAF Regt; Sqn Ldr R. S. Mason; Sqn Ldr F. H. E. Nunwick; Sqn Ldr R. D. S. Orchard; Sqn Ldr E. H. O'Toole; The Rev. D. E. W. H. Sheppard; Sqn Ldr M. Short, AFC; Sqn Ldr C. Sinclair; Sqn Ldr K. E. Woolridge; Acting

SERVICE AVIATION . . .



Long-range Sea Vixen, airborne recently for just over eight hours, being refuelled from another Sea Vixen by buddy pack. Pilot on the endurance flight was DH test pilot Chris Capper, with John Rye as flight test observer; pilot of the tanker was Peter Barlow, also one of the de Havilland test pilots

Sqn Ldr T. C. B. Hughes, RAFVR; Acting Sqn Ldr P. R. Mayle; Sqn Ldr G. Parker, RAF (RETD); Flt Lt W. S. Martin; Flt Lt R. E. Michie; Flt Lt N. M. North; Flt Lt R. H. Shepherd, RAuxAF; Flt Lt J. E. Torkildsen; Flt Lt A. S. Townsend, MB, BS, LRCP, DOBST, RCOG, RAFO; Flt Lt E. S. Williams; Acting Flt Lt B. L. Rees, RAFVR; Acting Flt Lt R. W. Thornton; Fg Off W. Finlay; Plt Off E. B. Shaw; M/Tech R. W. E. Claydon; M/Tech W. E. Greenhalgh; WO R. S. Barham; WO J. Buck; WO D. Cruckling; WO W. J. Fletcher; WO J. C. C. Ghey; WO R. W. Haysom; WO H. Lewis; WO S. Scamp.

Awards

Bar to Air Force Cross: Flt Lt. W. H. Evans, DFC, AFC.

Air Force Cross: Gp Capt K. Richley; Wg Cdr N. J. Carver; Sqn Ldr R. Langstaff; Sqn Ldr R. Ramirez; Flt Lt D. S. Bridson; Flt Lt P. S. Collins, BA; Flt Lt D. A. Cooper; Flt Lt J. D. Gibson; Flt Lt B. J. Lemon; Flt Lt H. D. Moseley; Flt Lt A. C. Musgrove; Flt Lt R. D. Stone; Flt Lt H. H. Thompson; Flt Lt F. L. Travers-Smith; Lt Cdr T. C. Evans, RN.

Royal Red Cross (Second Class): Sqn Off J. E. M. Kennedy, PMRAFNS; Flt Off A. McPhail, PMRAFNS.

Air Force Medal: F/sgt G. W. E. Foster; F/sgt P. W. Lawson; Sgt B. Kitchener.

British Empire Medal (Military): F/sgt T. W. J. Beasley; F/sgt E. G. M. Brer; F/sgt T. E. J. Flatt; F/sgt (now WO) T. E. Lowson; F/sgt B. F. McRann; F/sgt W. R. Miller, WRAF; F/sgt L. Mitchell; F/sgt T. W. Parmley; F/sgt N. G. Poore; F/sgt (now WO) B. L. Skea, RAF Regt; Ch Tech J. Bigmore; Ch Tech J. E. Chapman; Ch Tech W. L. Cooke; Ch Tech L. T. A. Matthews; Ch Tech R. J. D. Overy; Ch Tech B. W. Potts; Ch Tech W. R. Quinlan; Ch Tech L. W. Washington; Ch Tech D. R. Youle; Ch Tech J. C. Zammett; Sgt K. Adams; Sgt M. A. Anderson; Sgt J. A. Ashton; Sgt H. J. Bainbridge, RAuxAF; Sgt C. W. Cater; Sgt R. Davidson, RAF Regt; Sgt S. A. Fennell; Sgt W. F. Floydd; Sgt L. Graham; Sgt D. S. Hanson; Ch Tech J. S. Humphreys; Sgt A. Knowles; Sgt J. F. Langridge; Sgt J. E. Mackie; Sgt D. G. Midgley, WRAF; Sgt. D. Rose; Sgt G. Turner; Sgt C. W. Vessey; Cpl F. A. Bacon; Cpl T. H. Coram; Cpl Tech J. McQ. Shaw; Acting Cpl R. G. Russell.

Queen's Commendation for Valuable Service in the Air: Wg Cdr A. C. Davies; Sqn Ldr D. Adams; Sqn Ldr B. J. Ball, DFC; Sqn Ldr K. A. Hutchings; Sqn Ldr P. A. Latham, AFC; Sqn Ldr R. J. Linford; Sqn Ldr K. Smith; Flt Lt A. Bradshaw, DFC; Flt Lt T. J. Fairbrass; Flt Lt J. E. Freer; Flt Lt B. W. Gill; Flt Lt R. A. Gillam; Flt Lt H. L. Howes; Flt Lt G. L. Johnson; Flt Lt G. Jones; Flt Lt N. Lamb; Flt Lt V. McNabney, GM; Flt Lt C. E. Slater, DFC; Flt Lt T. W. Smail, DFC; Flt Lt D. A. Spackman; Fg Off G. E. Grimsdale; Fg Off J. A. Richardson; M/Plt H. J. Blackwell; M/Eng J. A. Higgins; F/sgt R. L. Turner; Lt Cdr T. E. M. Kirby, RN.

Caribbean Goodwill

A TWO-WEEK tour of the Caribbean is being made by a Shackleton squadron, No 224. Leaving Gibraltar next Monday (June 19) they are flying via the Azores to Bermuda and Jamaica, British Honduras and Trinidad. On July 4 the aircraft go from Jamaica to Caracas, Venezuela, with the band and drums of the 1st Battn the Royal Hampshire Regiment, who are among the British contingent attending July 5 celebrations of the 150th anniversary of Venezuelan independence. The force commander will be Air Cdre J. H. N. Pike, AOC Gibraltar; and the detachment commander Wg Cdr J. G. Duncan, CO of 224 Sqn.

Hermes "At Home"

FROM her Chinese cobblers and laundrymen below decks to her UHF aerials far above them, HMS *Hermes* presents a lively portrait of a modern aircraft carrier, and displayed her capabilities well in a "Shop Window" demonstration last week. Scimitars of 804 Sqn and Sea Vixens of 890 Sqn were launched and recovered, in between performing some impressive manœuvres; two Gannet AEW.3s of 849 Sqn did a 3hr sortie, then showed themselves off before landing; and a Whirlwind of 814 Sqn displayed dipping asdic technique. In addition to what went on aboard the carrier, there was a replenishment demonstration by RFA *Tideflow*, anti-submarine and AA firings by the frigates *Tenby*, *Puma* and *Rhyl* and a show of above-surface equipment by the submarine *Turpin*.

In the flying demonstration both the Scimitars and Sea Vixens showed their weapons capability with bombs, cannons and rockets, and there was splendid verve in the aerobatic manœuvres, particularly those by Lt David Mears (Scimitar) and Lt Cdr W. R. Hart (Sea Vixen). A Buccaneer came out from A&AEE Boscombe Down to do a couple of flypasts. The last two Sea Vixens to land had to delay while a faulty arrester wire was removed, but otherwise there were no hitches in an absorbing afternoon's programme, with a commentary which covered everything from high g to the flight-deck handlers.

Captain and lord mayor: Capt D. S. Tibbits, who commands "Hermes" (see above), talking with Sir Bernard Waley-Cohen, Lord Mayor of London, during the latter's recent visit to the carrier. Behind is a Scimitar of 804 Sqn

RAFA in IoM

THE weekend of June 3/4 saw some 400 delegates, supported by hundreds of members and their families, at Douglas for the Royal Air Forces Association annual conference; and in welcoming members the Mayor (Alderman T. A. Quirk, JP) said what pleasure it gave his council that the RAFA had again selected the Isle of Man.

The president, Marshal of the RAF Lord Tedder, GCB, DCL, LLD, apologised to Conference for his absence in 1960 and thanked Air Marshal Sir Robert Saundby for deputizing last year. Lord Tedder said he was now "airworthy" but asked delegates to be gentle with him. The Queen's reply to the Association's greeting was read and Lord Tedder announced messages from the Duchess of Gloucester and the Duke of Edinburgh.

The annual report was submitted by council chairman Air Marshal Sir Harold Lydford, who reported growing membership but a need to awaken the "sleeping partners" at branches, who renew by post and are never seen—especially during Battle of Britain Week when collectors are so urgently required for Wings Day.

Mr K. T. Jago, MBE, vice-chairman, had submitted a detailed report on "Care of the Sick"; and after much discussion the resolve to have a second convalescent home in the south of England was rejected. National council assured delegates that no sick person—chronic sick especially—would lack a bed in the most suitable home to be found.

The Belgian delegate, supported by a Frenchman who had trained in the Isle of Man and who was in Douglas for the first time in 16 years—since his honeymoon there—received a great cheer when he mentioned this in seconding the proposal that "national" be deleted from the headquarters title. The resolution was carried amid great applause from representatives of the 6,753 overseas members—delegates present coming from as far apart as San Francisco and Dublin.

It was resolved to revive the RAFA Annual Reunion and to give more publicity to the great and varied work being undertaken by branches. The conference closed on Sunday afternoon with a moving speech from Lord Tedder, whose control of the gathering was courteously firm throughout.

Outside the conference itself were the rendezvous ball on the Friday night, Civic Reception on Saturday evening and—perhaps the most unforgettable moment—the parade and short Service of Remembrance at the war memorial on the Sunday morning.

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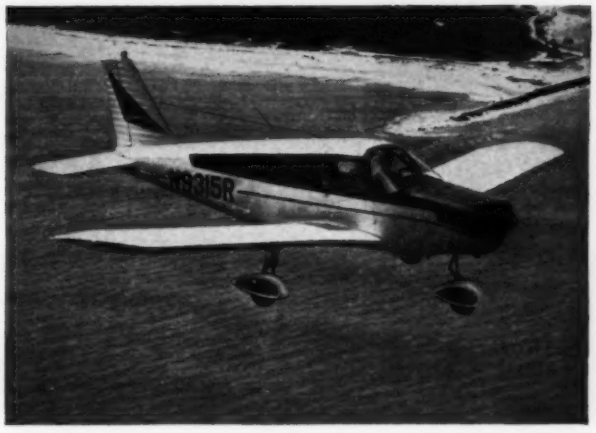

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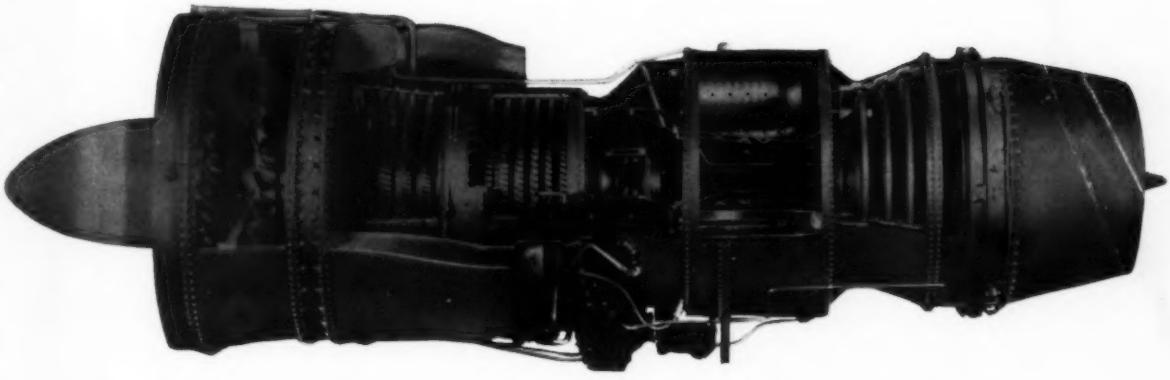

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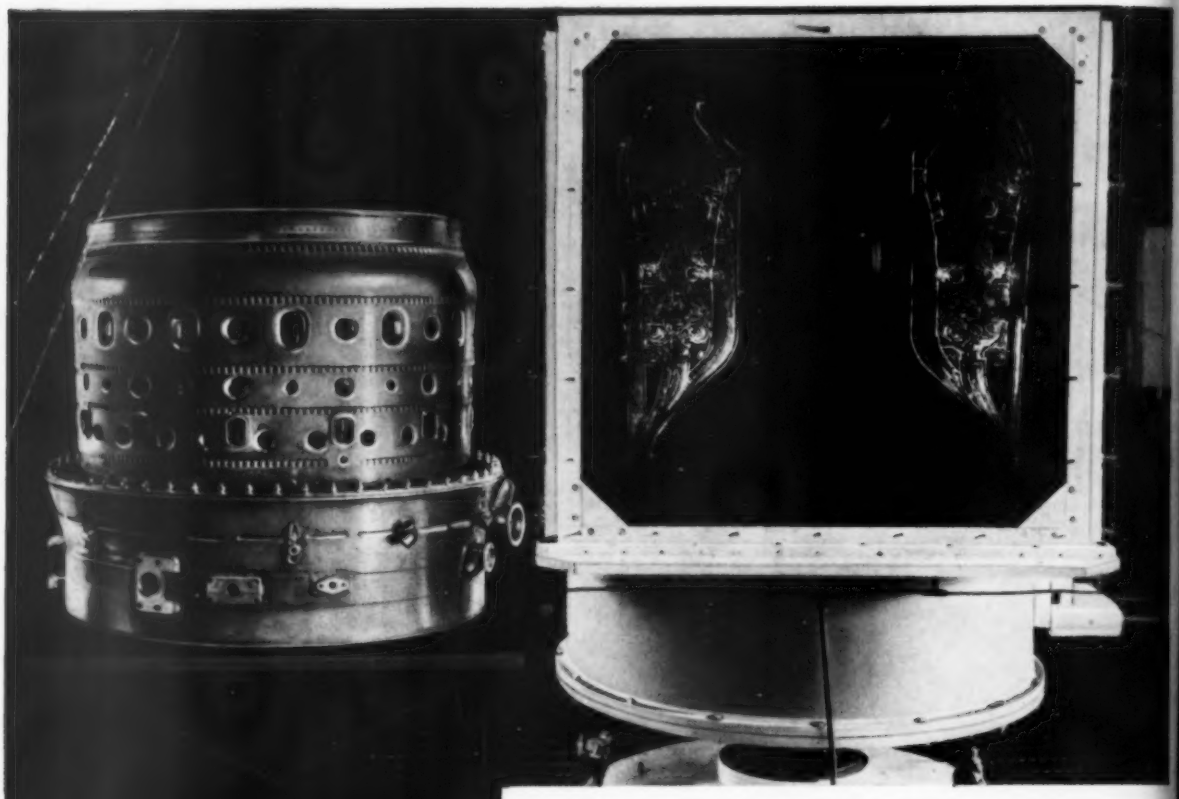

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